



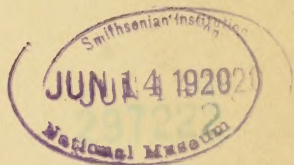


THE AMERICAN
MIDLAND NATURALIST

DEVOTED TO NATURAL HISTORY, PRIMARILY
THAT OF THE PRAIRIE STATES

JULIUS A. NIEUWLAND, C. S. C., PH. D.
EDITOR

27



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NOTRE DAME, INDIANA

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THE MIDLAND NATURALIST

Devoted to Natural History, Primarily
that of the Prairie States

Published by the University of Notre Dame,
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J. A. NIEUWLAND, C. S. C., Ph. D., Sc. D., Editor

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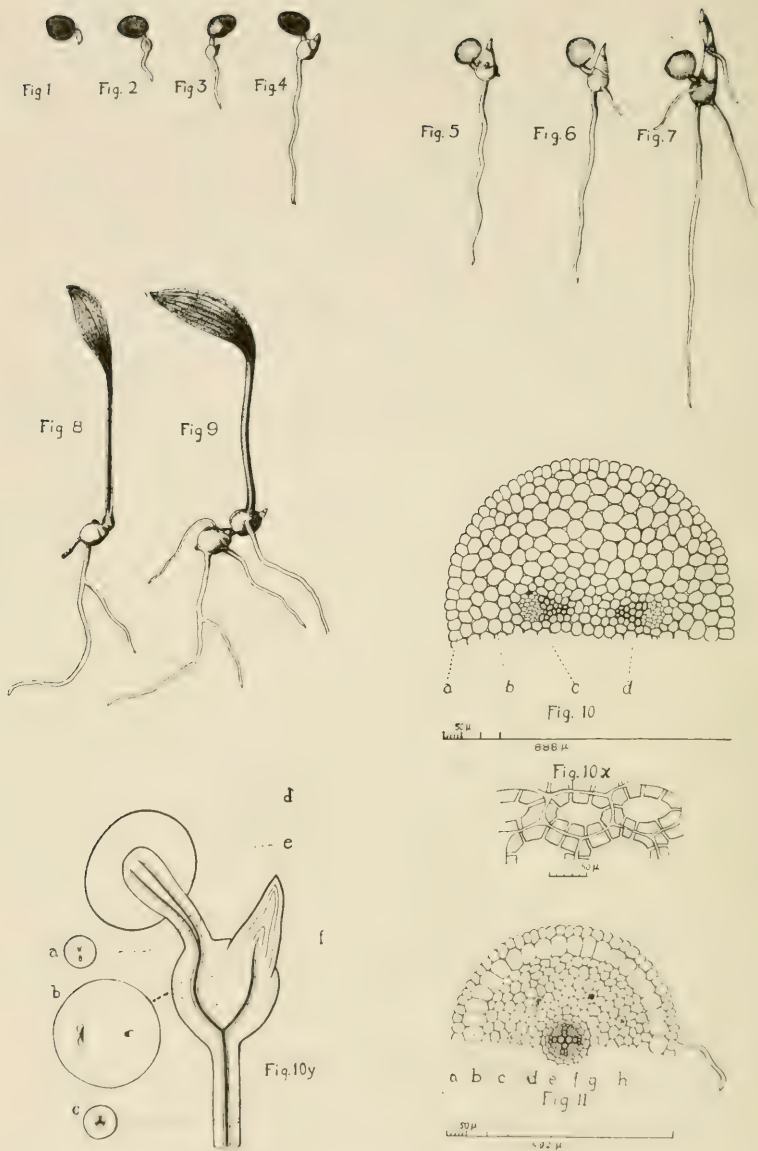


PLATE I. VOGT ON *POLYGONATUM COMMUTATUM*.

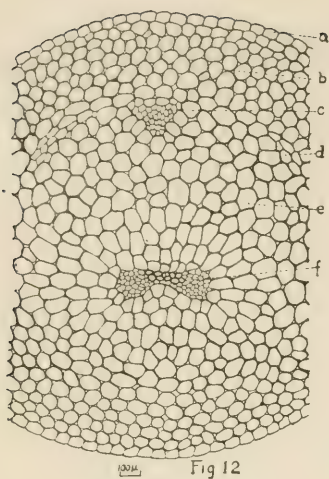


Fig 12

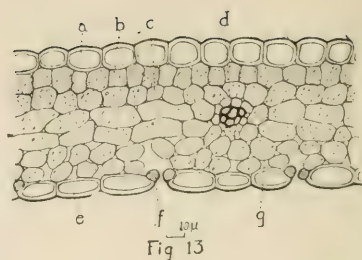


Fig 13

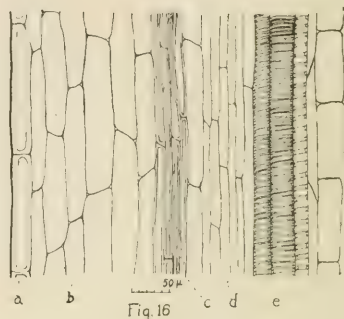


Fig 16

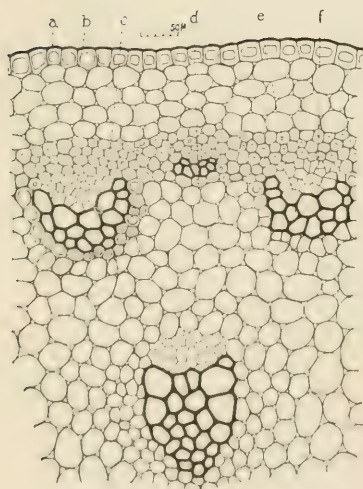


Fig: 17

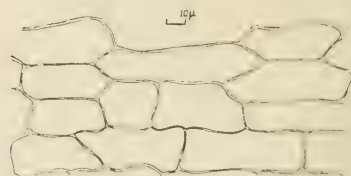


Fig. 14

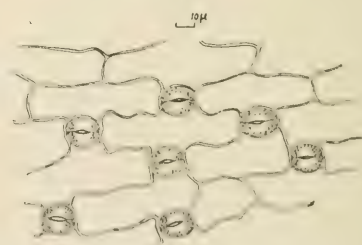


Fig 15

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VOL. IV.

JANUARY, 1915.

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THE ECOLOGY AND ANATOMY OF POLY- GONATUM COMMUTATUM.

BY RICHARD VOGT.

On account of its remarkably slow growth the plant which forms the subject of the following notes was expected to show peculiarities of both ecology and structure. The absence also of seedlings readily to be found by the superficial observer led us to seek more carefully for such specimens. As a result of these investigations we obtained what seemed to us rather interesting facts regarding the habits and the anatomy of the plant in various stages of development.

HISTORY.

The genus *Polygonatum*, to which the plant we have studied belongs, was first named by the Greek Dioscorides,¹ a contemporary of Pliny. The plants were recognized by the name *Polygonatum* by nearly all pre-Linnaean authors as will be seen in the accompanying list of synonyms. Some of the older authors using one worded names for genera took the common vernacular one corresponding to Solomon's Seal and called the plant *Sigillum Salamonis*: e. g., Brunfels, Gesner, and Tragus. Anguillara and Caesalpinus called the type plant of the genus *Frasinella*. Heister² rejected all older names and substituted the name *Salamonia* in honor of King Solomon. Linnaeus³ did not recognize the genus of the ancients but referred the plants to his newly made genus *Convallaria* of which the lily-of-the-valley* was the type. The plant on which Dioscorides founded the genus, and which since Linnaeus is still considered the type of the genus *Polygonatum*, is *Convallaria Polygonatum*, Linn. As early as 1549

¹ Dioscorides, Mat. Med. 4 : 5.

² Heister, Syst. 5 (1748).

³ Linnaeus, C., Sys. 1753; Gen. p. 96 (1737); p. 148 (1754); Sp.—Pl. p. 314 (1753).

this plant had been called by Fuchs⁴ by the correct and generally admitted binary name *Polygonatum latifolium*. As early as the fifteenth century and perhaps much earlier the plants were called Weiszwurz by the Germans, because of the characteristic white roots. All of the other contemporaneous European vernacular names were translations of the Latin *Sigilium Salamonis* or Solomon's Seal. Caspar Bauhin⁵ explains the name as well as the Dioscorean one: "*quod radix crebro geniculata sit*" because the root is much geniculate "*Vulgo Sigillum Salamonis haud dubie a vestigiis pluribus radici sigilli instar impressis,*" "commonly Solomon's Seal doubtless because of the many (stem) traces impressed upon the root like a seal." Leonhard Fuchs⁶ also had aptly accounted for the name nearly one hundred years before: "*Polygonatum Latinis dicitur. Officinis, item herbariis and vulgo Sigillum Salamonis, Germanis Weiszwurz (Gallis, signet de Salamo) hoc est radix alba nominatur. Polygonatum autem a radici geniculorum frequentibus nodis ex intervallis tumente appellaverunt.*" "(The plant) is called by the Latins *Polygonatum*; in the shops and by herbarians commonly Solomon's seal; by the Germans, Weiszwurz, that is, white root. *Polygonatum* they called it from the roots swelling at frequent intervals with bends and nodes."

In our region the genus is represented by two species *P. biflorum* Walt. Ell. and *P. commutatum* R. and S. The latter is the subject of this article. *P. commutatum* was first differentiated as a species from both European and other American members of the genus by Schulte under the name *Convallaria commutata*. Unaware of this publication Dietrich⁸ had published this plant as new under the name *P. giganteum* by which it was known until recently in some of our common American manuals. Later he admitted the priority of *P. commutatum* as a specific name.⁹

The following is a resumé of the synonymy of the generic and specific names.

POLYGONATUM. Dioscorides, Mat. Med. 4:5.

Also *Polygonatum*, Matthioli, Lacuna, Castor Durante,

⁴Fuchs, L., *Primi de Stirpium Historia*, p. 336 (1549).

⁵Bauhin, C., *Pinax*, p. 303 (1623).

⁶Fuchs, L. de *Historia Stirpium*, p. 199 b (1546).

⁷R. and S. Sept. 7., p. 1671 (1830).

⁸Otto and Dietr. *Gartenz.* 3 : 322 (1835).

⁹Otto and Dietr., *Gartenz.* 3 : 223 (1835).

Comerarius, Fuchs, Dodonaeus, Cordus, Gesner, Lobelius, Tabernaemontanus, Gerard, Lonicer, Cusa, Thalius, Clusius, Turner, Caesalpinus, and Bauhin. Tour., Els. p. 69 (1694); I. R. H., p. 78 (1700); Hill, Br. Herb. p. 320 (1756); Zinn., Cat. Pl. p. 59 (1760); Morandi, Hist. Bot. Pract. p. 105 (1761); Adanson, Fam. des Pl. p. 54 (1753). *Sigillum Salamonis*. Brunfels, Gesner, Tragus. *Convallaria*. Linn., Syst. (1735); Gen. p. 96 (1737), 148 (1754); Sp. Pl. p. 314 (1753) *Axillaria*. Raf., Jour. Phys. 89: p. 261 (1819). Am Month. Mag. 266, (1818).

Polygonatum commutatum. (R. and S.) Dietr., Gartenz. 3, p. 223 (1835).

P. giganteum l. c. p. 322. *Convallaria commutata* R. and S. Syst. 7, p. 1761 (1830).

ECOLOGY OF THE SEEDLING.

The young seedlings of the plant were found to be very common during the past summer at several places near South Bend, and an opportunity was thus afforded of studying them under natural conditions. They seem to thrive best in a well drained sandy soil with plenty of vegetable mold and in a position where they will be mulched and protected but not much shaded by surrounding trees.

The mature plant with its berries, after wilting or drying up, falls to the ground sometime in October, and the berries are soon covered with fallen leaves and other debris. In this state they soon rot leaving the seeds entirely embedded. The seeds themselves are somewhat roughly spherical in shape and about three millimeters in diameter; at first of a pale yellow color with a brownish scar, they later become a dingy brown throughout. The bulk of the seed is found to be made up of endosperm food storage tissue of a horny consistency and composed of rather large cells, having thick and regular food deposits on the inner surface of their walls, and communicating with each other by numerous small canals (Fig. 10x). These seeds lie dormant during the fall and winter and germinate about the last of May or in early June, although they may sometimes be much retarded.

In germination the embryo breaks through the seed coat at a point about opposite the scar, and there are pushed out in succession; first the radical or primary root, next the hypocotyl which is soon slightly enlarged, and last the petiole of the coty-

ledon (Figs. 1 and 2.) (All drawings of the seedling are natural size.) The cotyledon itself remains inside the seed to act as an organ of absorption. The primary root now strikes downward into the soil and may attain a length of about five centimeters the first summer (Figs. 2 to 7.) Meanwhile the hypocotyl gradually increases in diameter, and a slit opens in its side through which the epicotyl or plumule first appears as a small conical bud (figs. 2 and 3). The epicotyl pushes out through this slit and grows to a length of about one centimeter during the first season, bearing usually two or three membranous leaf scales, and at its base one or two secondary roots (Figs. 4 to 7). In none of the many seedlings observed did the epicotyl produce a green leaf the first year, but in all cases the plant remained entirely underground until the second spring. It will be seen therefore that the plant, having no green leaves, can produce no new organic material but is dependant until the second summer on that stored in the seed. Such of this food material, however, as is not used in the first season's growth does not apparently remain in the seed, but is passed downward through the cotyledon and its petiole into the hypocotyl, where it is stored in a form probably far more readily available than the horny endosperm of the seed. This transfer is shown by the fact that before fall the seed and cotyledon are withered and soon afterwards decay, while at the same time the hypocotyl becomes enlarged, forming a tuberous body about the same in size as the original seed (Figs. 4 to 7). All, therefore, that the plant does during its first growing season is develop a root system, form a good-sized bud (the epicotyl), and transfer the remaining food from the seed into the hypocotyl where it will be ready for immediate use at the beginning of the second season. It will be seen that in this way the hypocotyl as well as the epicotyl takes part in forming the embryonic rhizome of the plant.

By the second spring the decay of the seed and cotyledon is complete, and the primary root now also withers away leaving thus two scars on the tuberous hypocotyl where these parts were once attached (Figs. 8 and 9). A single long-petioled green leaf is now sent up from the tip of the epicotyl; it will be noted that this is the first part which is visible above ground, the plant being in its second year of growth (Figs. 8, 9). During this second summer the old secondary roots also increase in size and new ones are sent out from various points on the epicotyl (fig. 9).

As fall approaches the epicotyl about the base of the leaf enlarges forming a second tuber similar in appearance to the old hypocotyl and separated from it by a narrow constriction (Fig. 9). In fall a rather large bud is produced in or near the axil of the leaf, and the leaf itself withers away, leaving an elongated scar on this second tuber. During the third summer a second single leaf and a third tuber are formed almost exactly like those of the previous year, and there is a further development of the root system. The leaf decays in fall leaving a long transverse scar on the third tuber.

The fourth year a true aërial stem with two or sometimes three leaves is sent up by most and probably by all of the seedlings not accidentally retarded in growth. In no case was such a stem found earlier than the fourth year. In perfect plants then the fourth tuber is always found bearing a round stem scar produced by the dropping off of this first stem and readily distinguishable from the previous leaf scars. About this time, however, the first tuber or old hypocotyl usually decays, so that four-year-old rhizomes are not always found with four tubers. On this account it becomes increasingly difficult to determine the exact age of a plant by inspection only.

Moreover after the fourth year the constrictions between the tubers become less marked until in later life an almost continuous rhizome results with only joints and stem scars to mark the annual growth, the only decrease in diameter being in the parts formed at the time of seasonal droughts and fruit production in late summer and fall. There is a very gradual increase in the size of the successive aërial stems, and it is perhaps not until about the tenth year or even later that any flowers or fruit appear. Thus the development of the seedling is a very slow process, and, since the growth of the mature rhizome is by no means fast, it will be seen that some of the ordinary large branching colonies must be very old to have reached such a size.

THE ANATOMY OF THE SEEDLING. .

GENERAL NOTES ON THE VASCULAR SYSTEM (FIG. 10Y DIAGRAMIC).

The primary root (c) has a single radical wood bundle, and this divides on entering the hypocotyl (b), one branch going upward into the petiole of the cotyledon (a) and the other to the epicotyl (f) at the opposite side. That which enters the petiole of the cotyledon again divides and the branches continue almost

to the end of the cotyledon where they gradually disappear. This bundle of the hypocotyl is seen about to divide in figure 12, f. The epicotyl (f) has at first no definite vascular bundles, but later a number of closed collateral bundles are formed most of which are in connection with the secondary roots that are sent out directly from the epicotyl. There is, however, some further development of conducting tissue leading from the hypocotyl into the epicotyl as lateral branches of the original bundle (Fig. 12, f). In the cross section of the hypocotyl (Fig. 12) the main bundle (c) with its branches (d) are seen in the form of a semi-circle but as they approach the epicotyl they seem to take the form of an almost complete circle.

THE PRIMARY ROOT (FIG. 11).¹

The wood bundle of the primary root is of the radial type with alternating phloem (leptome) (f) and xylem (hadrome) (g) rays and is most often triarch but sometimes diarch or tetrarch as in the illustration. The xylem growth is exarch, and the ducts are of the ring and spiral types. The bundle is surrounded by a pericycle (e) of small flattened cells and an endodermis (d) which although not composed of thick walled cells is nevertheless very distinctive. The cortex (c) consists of about seven to ten irregular layers of short cylindrical parenchymatous cells which contain some raphides (h). The outer cortical layer is composed of larger cells (b), and these have a marked palisaded appearance. The epiblema cells (a) are small and rather thin walled even on the outer side.

THE HYPOCOTYL (FIG. 12).

The bundle (f) leading to the cotyledon shows in cross section as an irregular double row of xylem ducts with the phloem grouped about the ends of the row and on the side next the epidermis. The bundle (c) leading into the epicotyl is of the collateral type with what seems to be a nearly semicircular cambium strand (d) extending out a considerable distance on each side. This strand takes on the form of an almost perfect circle as it nears the epicotyl. In this semi-zone secondary bundles are later formed leading from the hypocotyl into the epicotyl. The space between these bundles is occupied by large cylindrical parenchyma cells (e), and the surrounding cortex (b) is of similar structure. The whole

is enclosed by an epidermis (dermatogen) (a) with a slightly thickened outer wall.

THE COTYLEDON AND ITS PETIOLE (FIG. 10).

These have two wedge-shaped closed collateral bundles with xylem (d) directed inward and phloem (c) outward. These bundles are produced by the splitting of the single flattened bundle of the hypocotyl as shown in the diagram (Fig. 12). They are very well developed since all the water entering the seed and the entire food supply which is derived from it must pass through them. The remaining portions of the cotyledon are made up of simple parenchymatous tissue (b) with a thin walled epidermis (a).

THE EPICOTYL.

The epicotyl of a germinating seedling is made up of embryonic parts which have no marked vascular structure. Later its makeup is much the same as that of the mature rhizome into which it develops.

HISTOLOGY OF THE MATURE PLANT.

THE ROOT (FIG. 21).

The epiblema (a) of the root is composed of rather thin-walled cells somewhat elongated lengthwise of the root. Beneath these is a peculiar layer of enlarged cortical cells (b) having a palisaded appearance as in the primary root. The remainder of the cortex is made up of smaller cells (c), and in young roots is from eight to ten cell layers in thickness. Next in order are a well marked endodermis of thin walled cells (d), and a pericycle surrounding the central stele. The stele itself is of the radial type with from three to seven exarch xylem (hadrome) rays (g) and alternating phloem (leptome) strands (f). Fig. 22 is a cross section of a heptarch or seven rayed bundle from a young root tip, showing the innermost layer of ordinary cortical cells (a), the endodermis (b), and the pericycle (c) before the cells have taken on their ordinary flattened appearance. Only the protoxylem (d) and protophloem (e) have been formed, the rest of the conducting tissue being as yet undeveloped. The large cells (f) embedded in the pith (g) form metaxylem a little later.

THE RHIZOME (FIGS. 18 and 19).

In the rhizome will be seen first the epidermis (Fig. 18, a, Fig. 19, a) of flattened brick-like cells with a thickened outer wall. Beneath these is the cortex (Fig. 18, b, Fig. 19, b) of roughly

ellipsoidal cells which gradually increase in size towards the center of the rhizome and merge without any line of demarcation into the large parenchymatous cells which make up the bulk of the organ. Many of these contain a few starch granules (Fig. 19, d), and there are a number of enlarged cells with raphides (Fig. 18, c, Fig. 19, c). The numerous scattered wood bundles vary in type from the closed collateral (Fig. 19, n) to those which are rather completely and typically amphivasal (Fig. 20). This transition shows the close relation that exists between these two types. The amphivasal bundles are mostly found in the center of the rhizome and in the older portion of its length, showing that they are a subsequent modification of the closed collateral. The xylem (Fig. 18, f, g, Fig. 19, e) is of the spiral and pitted types. The phloem (Fig. 18, h, Fig. 19, f) consists of the ordinary elongated sieve cells. Around each bundle there are one or two irregular layers of elongated cells which appear as a sheath (Fig. 18, d, e; Fig. 19, g), but these are not always distinctive. Fig. 20 shows an amphivasal bundle from the center of an old rhizome. The xylem (c) completely surrounds the phloem (f) and there are two sheath layers (a, b) separating the bundle from the surrounding parenchymatous tissue (e).

THE STEM (FIGS. 16. and 17).

The stem has an epidermis of brick-like cells with greatly thickened walls (Fig. 16, a; Fig. 17, a). Beneath this are found three or four layers of large thin-walled cortical cells (Fig. 16, b; Fig. 17, b). Next in order is a very distinctive zone of hardened schlerenchyma made up of cells whose walls are so much thickened that only a small lumen remains (Fig. 16, c; Fig. 17, c). This schlerenchyma appears to develop from the cambium layer which earlier in the season formed the wood bundles. One small bundle (Fig. 17) is shown entirely embedded in the layer and most of those nearest it are at least partially surrounded. The remaining part of the stem enclosed in this schlerenchyma cylinder is composed of rather loosely arranged pith tissue (Fig. 17, d) which contains the numerous scattered vascular bundles. These are of the closed collateral type with the xylem (Fig. 16, e; Fig. 17, e) directed towards the center of the stem. The xylem consists mostly of spiral ducts, and the principle element of the phloem is the elongated sieve tube cells (Fig. 16, d; Fig. 17, f).

THE LEAF (FIG. 13, 14, 15).

The upper epidermis of the leaf (Fig. 13, a; Fig. 14) is composed of elongated and flattened cells with thickened walls. The lower epidermis (Fig. 13, l; Fig. 15) is similar but is perforated by numerous stomata (Fig. 13, f). There are two palisaded cell layers immediately under the upper epidermis and these contain most of the chlorophyll (Fig. 13, b and c). Between the palisade cells and the lower epidermis the space is taken up by loose parenchymatous tissue about four cells in thickness (Fig. 13, g). These cells have some chlorophyll and communicate with the stomata through the large intercellular spaces.

RESUME.

The following facts are considered to be peculiarly characteristic of the plant:—

1. No part of the seedling appears above ground the first year, but the plant simply transfers the food from the endosperm into its own storage parts and subsists upon it until the first leaf is completely developed during the second summer.

2. A single green leaf is sent up in the second year and another in the third year, but no aërial stem is produced before the fourth year.

3. When the fourth tuber of the rhizome has appeared, the first has usually rotted, making it difficult to estimate the age of a young plant by simple inspection.

4. A well marked vascular development of the cotyledon is a notable feature of the seedling anatomy.

5. In primary roots there is a variation of the plerome from diarch to tetarch and in secondary roots from triarch to heptarch.

6. Most of the wood bundles in the constricted portion of the annual growth are amphivasal while all of those in the thicker portion are collateral. What seems to be a probable explanation of this fact might be given here. The aërial stem is produced each year from a bud at the extremity of the rhizome, but the rhizome later continues growth beyond this point leaving the aërial stem in the position of a branch. The first part of this annual growth of the rhizome is a much thickened food storage organ, and since at this time it is not in main line of water condition there is little use for xylem and the bundles there remain collateral. The continuations of these bundles in the later and more constricted

part of the annual growth are also at first collateral, but winter overtakes these in an undeveloped condition. The following spring most of these bundles divide at their growing point, part of the new elements going upward into a new aerial stem and part into a further extension of the rhizome. On account of the great demand for soil sap in the new stem the unfinished collateral bundles in the adjacent constricted part of last year's rhizome growth develop an unusual amount of xylem in connection with new secondary roots and become amphivasal. In the more distant expanded part of the rhizome the continuations of these bundles being already mature remain collateral as at first, but many of them develop excessive numbers of xylem elements which do not, however, encircle the phloem (Fig. 17.)

EXPLANATION OF THE FIGURES.

Figs. 1-9. Illustration of the stages of development of the seedling from the time of germination until the end of the second year's growth. All of the illustration are exactly life size. Fig. 1. Germinating seed with primary root and hypocotyl emerging. Fig. 2. Later stage with elongated primary root, swollen hypocotyl, and the slit through which the epicotyl is to emerge. Fig. 3. The epicotyl appearing through the slit. Fig. 4. Stage in the further development of the epicotyl and primary root. Figs. 5 and 6. Formation of secondary roots. Fig. 7. Elongation of epicotyl and production of leaf scales. Fig. 8. Seedling with leaf in second season of growth. The cotyledon has disappeared and the primary root is withering. Fig. 9. A later stage in the second year's growth showing the formation of the second tuber.

Fig. 10. Cross section of the petiole of the seedling cotyledon. (a) epidermis, (b) cortical tissue, (c) phloem, (d) xylem.

Fig. 10x. Food storage cells of the seed endosperm.

Fig. 10y. Longitudinal diagrammatic section of the tissue systems in a young seedling. The side figures show diagrammatic cross sections at the places indicated by the dotted lines. (a) petiole of cotyledon, (b) hypocotyl, (c) primary root, (d) seed, (e) cotyledon, (h) epicotyl.

Fig. 11. Cross section of the primary root of the seedling. (a) epiblema, (b) palisaded layer of the periblem, (c) ordinary periblem cells, (d) endodermis, (e) pericycle, (f) phloem and (g) xylem, constituting the plerome, (h) raphides.

Fig. 12. Cross section of the hypocotyl. (a) dermatogen, (b) periblem, (c) bundle leading to epicotyl, (d) cambium layer, (e) central parenchymatous tissue, (f) bundle leading to cotyledon.

Fig. 13. Cross section of the leaf of amature plant. (a) upper epidermis, (b and c) palisaded layer, (d) wood bunble, (e) lower epidermis, (f) stoma, (g) loose chlorenchyma.

Fig. 14. Surface view of upper epidermis showing cell structure.

Fig. 15. Surface view of lower epidermis containing stomata.

Fig. 16. Longitudinal section of mature stem taken late in season when growth in thickness had ceased and all of the tissues were in permanent condition. (a) epidermis, (b) cortex, (c) schlerenchyma, (d) pith, (e) xylem, (f) phloem.

Fig. 17. Cross section of the same. (a) epidermis, (b) cortex, (c) schlerenchyma, (d) pith, (e) xylem, (f) phloem.

Fig. 18. Longitudinal section of mature rhizome. (a) epidermis, (b) cortex, (c) cell containing raphides, (d and e) sheaths of elongated cortical cells, (f and g) xylem, (h) phloem. The bundle is amphivasal, and a duct is shown at the extreme right.

Fig. 19. Cross section through the mature rhizome. (a) epidermis, (b) cortex, (c) cell with raphides, (d) starch granules, (e) xylem, (f) phloem in an almost amphivasal bundle, (g) sheath of cortical cells, (h) a small typical collateral bundle.

Fig. 20. Cross section in detail through a more typical amphivasal bundle from center of an old rhizome. (a and b) sheath layers, (c) xylem, (d) cells which will later form xylem, (e) cortex, (f) phloem.

Fig. 21. Cross section of a small secondary root. (a) epibema, (b) outer palisaded layer of periblem, (c) ordinary periblem cells, (d) endodermis, (e) pericycle, (f) phloem, (g) xylem.

Fig. 22. Cross section of the wood bundle from the tip of a larger secondary root on an older part of the plant. (a) periblem, (b) endodermis, (c) pericycle, (d) xylem, (e) phloem, (f) cells which form meta-xylem, (g) pith cells.

The scale of magnification accompanies each figure.

ABNORMAL FLOWERING OF HEPATICA.

BY J. A. NIEUWLAND.

The tendency to redundancy of sepals in *Hepatica*, our common liver-leaf, a plant that adds so much to the beauty of our early spring woods, was noticed several hundred years ago by Lobelius¹ or as he is also known de l'Obel. He even gave the double flowered plant the varietal name, customary in those days, calling it *Hepatica trifolia polyanthos*, or doubled flowered *Hepatica trifolia*. Parkinson² in 1629 also describes such plants under practically the same name. The Liverleaf itself was even earlier called *Hepatica* by Bock³ in Brunfels great work of botany, the first that included good natural lifelike illustrations of plants in the sixteenth century.

Since in this plant it may be considered that the so-called "sepals" arise by the change of the stamens into these in doubling,

and that the latter proportionately diminish in number and often disappear entirely not only when cultivated but also wild, it is probably worth while considering them at least in part as real petals. The flowers of the plant are then to be considered as really rather asepalous than apetalous. Such double flowers have been found as intimated even in their native haunts in perfectly wild conditions.

Color variations are even more common. A hillside of plants of *H. acuta* was seen during the last season where the flowers ranged from perfectly pure white through lavender, pink, rose, purple, all with or without darker margins to light blue dark blue and even the darkest violet, all the plants being indiscriminately scattered over the hillside facing the sun. I could only account for this wonderful show of color variation from the fact that the previous fall the area had been burnt over. A similar condition seemed to cause all or nearly all of the plants of *Viola populifolia*, our common blue violet, to have blotched and streaked petals on their flowers. These violets were found in this condition only where the leaves were burnt away the year before. Some of these were transferred to a garden and bloomed the second season with similarly blotched flowers, blue and white streaked.

A plant of *Hepatica* was found in which all the bracts were very close to the flower parts, in fact almost on the torus of the flower. These bracts were distinctly three-lobed and seemed to approximate the shape of the true hepatica leaves in being very broad, whereas the ordinary bracts are usually oval and quite entire or ovate. In the flowers of this plant the outer "sepals" colored in the typical plant were here green and herbaceous on the margins. This would seem to indicate a tendency on the part of the "sepals" to become bractlike or become real green sepals. As there are in most plants of *Hepatica* two more or less complete whorls of the so-called "sepals" it were perhaps not incongruous to consider that these plants have both real sepals and real petals in more or less complete whorls usually alike, but in such cases atavistically tending to differentiate themselves, the outer gradually changing themselves under normal conditions into bracts gradually, and the inner similarly showing by the change of stamens into them that there is no break in the number of floral envelopes.

Another anomalous condition of inflorescence in this plant

was seen at the same time in a number of individuals. One of these had beside the normal one-flowered about six others with two or three subsessile flowers in the bracts. In one instance the third flower was neutral having "sepals" alone. This condition was not one of fasciation as the usual flattened peduncles of greater diameter in one way were absent and the stalks appeared no different than in normal. In several cases the usual three bracts were present and the supernumerary flowers came from these in umbel fashion. In one case two flowers were found at the end of a common pedicel (bracts some distance below) and on a common receptacle or double torus. In several the outer bracts of the cluster were 2 to 3-lobed or notched. The several flowers had very distinct pedicels nearly all with their own secondary bracts and only one bractless. In another a bent one-bracted node or joint was found at the base of the several pedicels of the umbel-like cluster. Still, another more peculiar specimen consisted of a peduncle with a larger bract near the top. From the axis of this arose two pedicels, one with a normal flower, the other with two flowers on a common torus. The larger of these two had three three-notched bracts and the other two three-notched bracts at the apex.

A CORRECTION NEEDING CORRECTION.

Some years ago the term *macrospore* for the larger non-sexual specialized reproductive cell of the heterosporous pteridophyta was found objectionable because the name was deemed inaccurate in meaning. The word *μακρός* (*macros*) in Greek means "long" and the spores in question are not long but large, or big. It might have been thought by some more or less conservative botanists of the "laissez faire" type that the attempt at correction might be considered as fastidiousness. Scientists, however ought to be exact especially in their terminology, though an equally industrious attempt to correct nomenclature usually raises a clamor among the morphologists who carp at continual name changing. Be this as it may, the object in question suggests rather the idea of largeness, and hence ought to have come from the Greek word *μέγας* (*megas*). The name was accordingly changed to "*megaspore*" and in a few months it was even enthusiastically received by all without exception, and, as far as we

can find, still holds sway. We wondered at the time the name was proposed, how long it would take to find that though correctly derived as to its meaning it is grammatically wrong in form. In fact we have after these number of years without shadow of suspicion on the part of many, had to endure an etymological monstrosity, which has not only been taken up into the terminology of the science but accepted by otherwise reputed scientists, and that without any question as to the credentials of the correction deserving commendation.

A mere beginner in Greek literature would have known from his first few lessons in that language that any name coming from the word μέγας, fem., μεγάλη, neut. μέγα, having the genitive μεγάλου, must according to the rules for the derivation of words in the ancient languages come from the root of the word. The root of the word in question is μεγαλ, from the genitive μεγάλου. The name then should have been **megalospore**, the "O" being inserted before consonants. The taking of the simple nominative case of a word may be an easy way for the name tinkers, but it is as unpardonable to burden a nomenclature or a terminology with these mongrel names, as is the using of a plural form of verb with a singular subject. The former moreover is not nearly as uncommon as one would at first suspect. It may be said on the one hand that this matter is not strictly botanical in relevance and of minor moment, but the dignity of a science merits better from its makers of names. On the other hand it may be asked "Why was not attention called sooner to the matter? instead of criticizing when perhaps too late?" It is to us still a matter of wonder that the name was not sooner amended, and perhaps, such is the indifference on the part of our writers or maybe rather ignorance, that the results might have been the same in the long run anyway.

As an example of the proper use of names with μέγας we have the following plant names, and more may be found in the Index Kewensis: *Magalodonta*, Greene, *Megalotropus*, *Megalachne*. On the other hand *Megastachya*, *Megastigma* show that our nomenclature as well as our terminology may be improved. Moreover as the name of the group of so-called brown algae we say *Melanophyceae* (instead of the incorrect *Melaphyceae*) though the derivation is from the Greek word μέλας, μέλαινα, μέλαν, meaning black.

DISTRIBUTION OF OUR BIRDS IN SPRING.

BY BROTHER ALPHONSUS, C. S. C.

In four springs, the Blue Jay was least abundant in March, there having been a total of 72 records for that month. In the same period, there were 111 records for April and 113 for May. A comparison of the totals for each spring shows considerable disparity. Between the highest total and each of the others there were respectively 6, 18 and 30 records. The total number of records for the four seasons was 306, the species not having been observed on 62 days.

Unlike the Blue Jay, the Crow's records in four years, show a decrease from March to May, the totals for the three months being 101, 93 and 76 records. The various totals for each year show successively differences of 18, 29, 23 records fewer than the highest total in 1910. There is a very slight difference between the records of 1911, 1912, 1913, 11 records being the highest and 5, the lowest. The total for the four seasons was 270 records,

The Snowbird, for four years, was most abundant in April, the total number of records for that time having been 104. For the same period, March shows 71 and May 5 records. In March, the species was most unevenly distributed, as the number of records for four years shows—27, 14, 9, 21. In the totals for each of four seasons, the greatest difference was 16 and the smallest, 5 records. The total for four springs was 180 records.

The Bluebird presents records that are exceptional in one year—1912. The total for the spring of that year was 17 records, which was 28 fewer than the lowest total of any of the other three years. For four springs, the species was most abundant in April and least plentiful in May. Leaving out the records for 1912, and there is but a slight difference in the totals for March and April, 63 records for the former and 70 for the latter. Making a comparison, without the records for 1912, we find the various totals for the other years showing 29 records as the greatest difference and 19 as the least. The total for four years was 191 records.

The Robin shows exceptional irregularity in March, 1912—, there being only 9 records for that month. Barring this exception, the species is a typical example of great regularity in all the spring months. In March, 4 records was the greatest difference, and 2

records, the smallest; in April, the only difference was 2 records; in May, there was but one record fewer, in 1911. The Robin's total number of records for four seasons was 321—the species not having been seen on 47 days.

The Bronzed Grackle was least abundant in March, having 73 records in four years. The cold winter of 1912 shows only 8 records for March. The species was very regular in April and May, with a difference of only 4 records; and deducting the extra day in May, there would have been only 2 records fewer in April. The total for four springs was 313 records.

The Song Sparrow, in March, had the same number of records as the Bronzed Grackle—73. There was great regularity in April and May, the species not having been found only on one day in May in four years; and having been observed every day in April for the same time. In its total for four springs, the Song Sparrow exceeded the Bronzed Grackle by one record, having had 314 records.

Like the other spring migrants, the Meadowlark was least regular in March—having for four years a total of 60 records. In April and May, the species was abundant, and showed but 5 records as the difference between the totals for those months in four seasons. The total for four years was 292 records.

The White-breasted Nuthatch presents a case of singular irregularity in all the spring months. I shall give the complete records for the four years that the reader may see at a glance in what way the species was distributed.—Records for March: 3, 20, 0, 11;—total, 34. April: 7, 17, 7, 17;—total, 41. May: 8, 13, 4, 9;—total, 34. Totals for each spring: 1910, 28; 1911, 50; 1912, 11; 1913, 37. Total for four seasons, 126 records. My records for the species in the spring of 1914 were still more irregular.

In March, the Cowbird had but 13 records in four years. In April and May, the species was abundant, as the records for those months show—April having as a total 105, and May, 115 records. In the four seasons, the species totalled 229 records, falling considerably below the records of the Bronzed Grackle, but exceeding by nearly 50 records those of the Red-winged Blackbird.

The Red-winged Blackbird, in four years, totalled 18 records for March, 72 for April, and 90 for May; making the total for the four seasons 180 records. Unless an observer frequents a marshy part of the country, he will not obtain satisfactory records for

this species. For this reason, my own records, I know, are somewhat incomplete.

The Flicker was seen on 7 days in March, 1910; but was not recorded in that month in any other year. The total for April, in four years, was 87 records, with 33 failures; for May, 80 records, with 44 failures. The average total number of records for each spring was 43, and the total for the four seasons was 174 records.

In March, 1910, the Vesper Sparrow was seen on 9 days; in the other three years, these were no records for March. April totalled 81 records, and May, 91, for four years. Between the highest and lowest totals, in four seasons, there was a difference of 14 records. The average number of records for each spring was about 44, and the total for four years was 177 records.

The March records for the Mouring Dove totalled, in four years, 7; there having been none in 1912. The April records were 77; the May, 113; and the difference, 36 records. The difference between the highest and lowest totals, in four years, was only 9 records. For the four seasons, the average was nearly 52 records, and the total was 207 records.

The Phoebe, in four years, had 10 March records. In 1912, there were no records for March, two for April, and one for May. Although the totals for April and May, in the other years, were respectively 39 and 31 records, yet these figures do not give a correct idea of the distribution of the species. Barring 1912, April shows the greatest difference in its records to be 13, and May, 9. The four springs totalled 80 records. It would be interesting to determine the relative abundance of the Phoebe and the Wood Pewee. The latter being essentially a species of the woods, it is easy to record it daily, after its arrival in May. The Phoebe arrives, sometimes in March; but nests only in favorable places; and thus is not so easily recorded.

The records of the Kingfisher show that the species was most abundant in April, the total for four years being 41 records. In 1910, the April records reached 19, which was almost double as many as those of any other year. In May, there was uniformity in the number of records for each year, the highest being 9, and the total, 25. The species was exceedingly rare in March—only 4 records having been made in four years. For the four seasons, a total of 70 records is shown.

In April, the Towhee shows considerable disparity in its records; the highest being 15 and the lowest 4, with a total of 38 records—the largest number in any of the spring months. In May, 1911, there was no record made for the species; in 1912, only 4 records; in the other two years the records were uniform—15 and 18, respectively. In March, there were 2 records in 1910, and none in the other years. The total for four seasons was 77 records.

The Field Sparrow ranks among the most regular species. In March, the difference between the highest and lowest number of records was 5; in April, the difference was 6; in May, 5. In March, the total for four years was 5 records; in April, 100 records; in May, 105 records. The total for all the spring months was 220 records.

In March, the Chipping Sparrow was recorded 4 times in two years, but no record was made in 1912 and 1913. In April, the species was irregular, the lowest record having been 13, in 1912; and the total, 80 records, in four years. In May, the records totalled 120, with only 4 days on which the species was not seen. The average total for each spring was 51 records. In the four seasons, there was a total of 204 records, and 164 days when the species was not found.

In only one year, 1910, was the Sapsucker seen in each of the spring months. The total for that year was 23 records, which was either equal to, or greater, than the total of any other two years. The total for the other three years was 31 records; and for the four springs, 54 records. In 1912 and 1913, the species was recorded only in April, both years together totalling 23 records. In three years, the Sapsucker was not found in March; and in two years, it was not seen in May.

The Golden-crowned Kinglet had 6 records in March, 29 in April, and none in May. The total for four springs was 35 records. The Ruby-crowned Kinglet had no records in March, 19 in April, and 10 in May. The total for four seasons was 29 records. From these records, the reader may readily see which species is the hardier and the more abundant.

Although the Goldfinch is a species that may be found in any month of the year, still my observations for the spring months in four years show that the Goldfinch had 2 records in March; 21, in April; 104, in May. The total was 127 records. It is difficult

to determine why the species was so seldom seen in March and April, unless the food supply is scanty in those months.

In four springs, the Red-headed Woodpecker was recorded but twice in March; and was recorded on 36 days in April, and on 116 days in May; making a total of 152 records. Now the writer has a very interesting fact to state about this species, which he considers the most remarkable case of disparity in distribution that has ever come under his observation. In the spring of 1914, the Red-headed Woodpecker was recorded on 26 days in March, and on 28 days in April; making a total of 54 records. The species did not migrate in the autumn of 1913, and remained all during the following winter, which was very mild.

The Downy Woodpecker, in 1910 and 1912, had but 20 records; in 1911 and 1913, the species had 64 records. Such great disparity of distribution, in four years, seems remarkable; and yet it is typical of the species, which is always comparatively rare in May, and sometimes in March and April. Like the White-breasted Nuthatch, the Downy Woodpecker is seldom seen during the nesting season. The total number of records for the species in four springs was 84.

The Tree Sparrow was recorded 28 times in March and 18 times in April, totalling 46 records. In three years—1910 to 1912—the species had 15 records for March; and 13 for that month in 1913; thus showing irregularity for March. In April, a similar irregularity is evident from the following records: 1910, 0; 1911, 4; 1912, 10; 1913, 4. I have found this species abundant in winter during mild weather; and when spring arrives early in March, the Tree Sparrow should be regularly seen during that month.

The Brown Creeper was present on 8 days in March and on 21 days in April. The highest record for the species was in 1913—March showing 5 and April 10 records. Why the other three years had only 14 records for their total, seems inexplicable. But this species, I have found, is irregular throughout the year.

In May, 1910 and 1911, the Red-eyed Vireo had 4 records for each year. In 1912, the species had 13 records; in 1913, 12 records; the total for four years being 33 records. The Red-eyed Vireo is not often heard outside of deep woods; but why there should be such great disparity between the records of two sets of years, I can not explain.

The Rose-breasted Grosbeak was here on 4 days in May,

1910 and 1912; on 7 days in 1913; in 1911, the species did not appear. From these records, it will be seen that this Grosbeak is very locally distributed. So far, I have never recorded the species outside of spring.

The Loggerhead Shrike was recorded 4 times in March and 6 times in April, 1910; once in March and twice in April, 1912; twice in April and once in May, 1913; making a total of 16 records. This shrike nests usually in hedges, in outlying districts, which accounts for the few records that I obtained for the species.

The Killdeer, by its spring records, shows that it is a rare species during that season. In four years, March had 18 records; April had 28; and May had 27; making a total of 73 records. There is also a considerable difference between two set of years; 1910 and 1913 having together 51 records; and 1911 and 1912 showing only 22 records. The species is somewhat solitary during the nesting season, not often visiting places distant from the rest.

Among the species that were recorded only in April and May were: White-throated Sparrow, Hermit Thrush, Brown Thrasher, Barn Swallow, House Wren, Spotted Sandpiper, Baltimore Oriole, Warbling Vireo, Kingbird. The White-throated Sparrow, in four years, had 16 records in April and 40 in May; the total being 56 records. The Hermit Thrush was recorded on 29 days in April and on 75 days in May, with a total of 104 records. The Brown Thrasher shows 53 records for April and 109 for May, with a total of 162 records. The Barn Swallow was seen on 11 days in April and on 44 days in May, totalling 55 records. The House Wren had 9 records in April and 104 in May, with a total of 113 records. The Spotted Sandpiper was recorded on 15 days in April and 104 in May, with a total of 113 records. The Spotted Sandpiper was recorded on 15 days in April and on 89 days in May, totalling 104 records. The Baltimore Oriole was found on 2 days in April and on 117 days in May. The Warbling Vireo had 5 records in April and 130 in May. The Kingbird was seen once in April and 94 times in May.

Among the warblers recorded in April and May or in May alone were: Myrtle Warbler, Yellow Warbler, Yellow Palm Warbler, Redstart, Bay-breasted Warbler, Black-throated Green Warbler, Black and White Warbler, Maryland Yellowthroat, Black-throated Blue Warbler, Blackburnian Warbler, Black-poll

Warbler, Tennessee Warbler, Chestnut-sided Warbler, Magnolia Warbler, Sycamore Warbler, Canadian Warbler, Kentucky Warbler, Nashville Warbler, Prairie Warbler, Yellow-breasted Chat—in all 20 species.

The Myrtle Warbler was recorded 21 times in April and 41 times in May, totalling 62 records—which was the highest number reached by any of the warblers. The Yellow Warbler had 5 records in April and 53 in May. The Yellow Palm Warbler was found on 9 days in April and on 37 days in May. The Redstart was recorded twice in April and 10 times in May. The Bay-breasted Warbler was seen on 5 days in May. The Black-throated Green Warbler had 13 records for May. The Black and White Warbler was found once in April and 3 times in May. The Maryland Yellowthroat had one record in April and 18 in May; this species was not found in the spring of 1912. The Black-throated Blue Warbler was recorded once—in May, 1912. The Blackburnian Warbler was observed once in May, 1912, and once in May, 1913. The Black-poll Warbler was seen on 8 days in May, 1912, and on 11 days in May, 1913. The Tennessee Warbler had 9 records in May, 1912, and one in May, 1913. The Chestnut-sided Warbler was present on 4 days in May, 1912, and on 14 days in May, 1913. The Magnolia Warbler's records were: 9 in May, 1912; 4 in May, 1913. The Sycamore Warbler had 6 records in May, 1912. The Canadian Warbler was seen once in May, 1912, and twice in May, 1913. The Kentucky Warbler was found twice in May, 1912. The Nashville Warbler was recorded on 3 days in May, 1913. The Prairie Warbler and the Yellow-breasted Chat were each recorded once in May, 1913.

Some rare or very rare species were: Canada Geese, Hairy Woodpecker, Herring Gull, Chickadee, Bobolink, Least Flycatcher, Hummingbird, Louisiana Water Thrush, Screech Owl and Fox Sparrow. Canada Geese were recorded 8 times in March; Hairy Woodpecker, 3 times in March; Herring Gull, 6 times in March and once in April. The Chickadee had 6 records in March, 4 in April and 1 in May. This species is an inhabitant of deep woods, which it seldom leaves, except in autumn and early winter. The Bobolink shows 12 records for May. This species usually keeps to outlying meadows. The Least Flycatcher had 15 records in May. The Hummingbird was seen on 3 days in May. The Louisiana Water Thrush had one record in May, 1910; and 17

in May, 1913. If May is dry, this species may not be recorded. The Screech Owl was heard once in March and 4 times in May. The Fox Sparrow was found on 5 days in April.

A number of species were recorded so rarely that the reader can readily find information about them in the appended records of each species in all the months of spring.

The total number of species that were observed in the four springs, 1910-1913, was 111.

	1910			
	March	April	May	Total
Blue Jay	29	30	31	90
Crow	29	25	31	85
Snowbird	27	23	4	54
Bluebird	28	27	19	74
Robin	24	30	31	85
Bronzed Grackle	25	30	31	86
Song Sparrow	27	30	31	88
Meadowlark	24	30	31	85
White-breasted Nuthatch	3	7	18	28
Loggerhead Shrike	4	0	6	10
Canada Geese	4	0	0	4
Tree Sparrow	6	0	0	6
Cowbird	9	27	30	66
Flicker	7	23	21	51
Vesper Sparrow	5	24	21	50
Mourning Dove	3	19	28	50
Phoebe	3	6	15	24
Hairy Woodpecker	2	0	0	2
Kingfisher	1	19	6	26
Killdeer	9	6	5	20
Red-winged Blackbird	12	18	25	55
Herring Gull	2	1	0	3
Downy Woodpecker	2	6	1	9
Towhee	2	8	15	25
Prairie Horned Lark	2	0	0	2
Red-shouldered Hawk	1	0	0	1
Field Sparrow	6	28	29	63
Sapsucker	4	15	4	23
Chipping Sparrow	3	28	31	62
Golden-crowned Kinglet	1	7	0	8
Hell Diver	1	0	0	1
Brown Creeper	2	0	0	2
Goldfinch	0	10	28	38
Red-headed Woodpecker	0	10	29	39
Cardinal	0	3	4	7
Ruby-crowned Kinglet	0	8	4	12

	March	April	May	Total
White-throated Sparrow	0	5	14	19
Hermit Thrush	0	10	23	33
Tufted Titmouse	0	1	0	1
Brown Thrasher	0	13	30	43
Barn Swallow	0	1	10	11
Sparrow Hawk	0	1	2	3
House Wren	0	2	25	27
Spotted Sandpiper	0	1	19	20
Myrtle Warbler	0	0	15	15
Yellow Warbler	0	0	16	16
Baltimore Oriole	0	0	30	30
Warbling Vireo	0	0	27	27
Yellow Palm Warbler	0	0	12	12
Kingbird	0	0	23	23
Redstart	0	0	2	2
Bay-breasted Warbler	0	0	1	1
Catbird	0	0	24	24
Purple Martin	0	0	5	5
Rose-breasted Grosbeak	0	0	4	4
Chimney Swift	0	0	22	22
Black-throated Green Warbler	0	0	3	3
Scarlet Tanager	0	0	9	9
Chickadee	0	0	1	1
Crested Flycatcher	0	0	13	13
Orchard Oriole	0	0	21	21
Black and White Warbler	0	0	2	2
Maryland Yellow Throat	0	0	14	14
Alder Flycatcher	0	0	7	7
Dickeissel	0	0	10	10
Bobolink	0	0	6	6
Least Flycatcher	0	0	3	3
Red-eyed Vireo	0	0	4	4
Wood Pewee	0	0	11	11
Hummingbird	0	0	2	2
Louisiana Water Thrush	0	0	1	1
Indigo Bird	0	0	12	12
Loon	0	0	2	2

1911

	March	April	May	Total
Blue Jay	25	29	30	84
Crow	26	25	16	67
Tree Sparrow	5	4	0	9
White-breasted Nuthatch	20	17	13	50
Screech Owl	1	0	0	1
Chickadee	6	3	0	9
Bluebird	21	19	5	45

	March	April	May	Total
Robin	26	30	30	86
Downy Woodpecker	10	10	7	27
Song Sparrow	21	30	30	81
Meadowlark	16	29	30	75
Bronzed Grackle	21	30	30	81
Killdeer	2	4	4	10
Canada Geese	3	0	0	3
Red-winged Blackbird	3	11	20	34
Herring Gull	1	0	0	1
Red-headed Woodpecker	2	23	30	55
Snowbird	14	24	0	38
Field Sparrow	3	24	24	51
Brown Creeper	1	3	0	4
Golden-crowned Kinglet	2	3	0	5
Kingfisher	1	8	4	13
Phoebe	3	12	6	21
Mourning Dove	2	20	26	48
Chipping Sparrow	1	17	30	48
Winter Wren	0	4	0	4
Cowbird	0	25	28	53
Red-headed Woodpecker	0	23	30	53
Flicker	0	18	15	33
Goldfinch	0	5	25	30
Fox Sparrow	0	1		1
Towhee	0	11	0	11
Purple Finch	0	6	6	12
Vesper Sparrow	0	12	19	31
Hermit Thrush	0	13	5	18
Sapsucker	0	7	1	8
Brown Thrasher	0	12	23	35
Loggerhead Shrike	0	2	2	4
Hell Diver	0	1	0	1
White-throated Sparrow	0	3	6	9
Ruby-crowned Kinglet	0	2	3	5
Redstart	0	1	0	1
Barn Swallow	0	2	6	8
Myrtle Warbler	0	5	6	11
Spotted Sandpiper	0	4	24	28
Maryland Yellowthroat	0	1	3	4
Yellow Warbler	0	4	7	11
House Wren	0	2	28	30
Kingbird	0	1	21	22
Yellow Palm Warbler	0	1	2	3
Warbling Vireo	0	1	26	27
Nighthawk	0	0	5	5
Catbird	0	0	26	26
Baltimore Oriole	0	0	27	27

	March	April	May	Total
Chimney Swift	0	0	25	25
Cardinal	0	0	2	2
Purple Martin	0	0	5	5
Orchard Oriole	0	0	22	22
Whip-poor-will	0	0	3	3
Bobolink	0	0	1	1
Wood Pewee	0	0	17	17
Crested Flycatcher	0	0	14	14
Dickcissel	0	0	16	16
Scarlet Tanager	0	0	2	2
Red-eyed Vireo	0	0	4	4
Indigo Bird	0	0	5	5
Yellow-billed Cuckoo	0	0	11	11
Alder Flycatcher	0	0	1	1
Cedarbird	0	0	1	1

1912

	March	April	May	Total
Crow	20	24	12	56
Blue Jay	17	28	27	72
Tree Sparrow	4	10	0	14
Robin	9	28	31	68
White-breasted Nuthatch	0	7	4	11
Downy Woodpecker	2	5	4	11
Snowbird	9	29	1	39
Hairy Woodpecker	1	0	0	1
Snowflake	2	0	0	2
Red-poll	1	0	0	1
Killdeer	1	7	4	12
Cardinal	1	3	0	4
Bronzed Grackle	8	28	31	67
Meadowlark	9	29	26	64
Goldfinch	2	3	22	27
Song Sparrow	8	30	30	68
Bluebird	2	13	2	17
Red-shouldered Hawk	1	0	1	2
Herring Gull	1	0	0	1
Loggerhead Shrike	1	2	0	3
Field Sparrow	1	22	27	50
Brown Creeper	0	8	0	8
Fox Sparrow	0	5	0	5
Towhee	0	4	4	8
Vesper Sparrow	0	26	29	55
Red-winged Blackbird	0	2	1	3
Mourning Dove	0	16	29	45
Hermit Thrush	0	2	24	26
Cowbird	0	24	30	54

	March	April	May	Total
Golden-crowned Kinglet	0	13	0	13
Screech Owl	0	2	0	2
Kingfisher	0	4	9	13
House Wren	0	0	21	21
Flicker	0	18	19	37
Sapsucker	0	9	0	9
Chipping Sparrow	0	22	31	53
Barn Swallow	0	6	8	14
Brown Thrasher	0	12	28	40
Myrtle Warbler	0	5	8	13
Bobwhite	0	1	0	1
Spotted Sandpiper	0	5	26	31
Red-headed Woodpecker	0	1	28	29
Black and White Warbler	0	1	3	4
Warbling Vireo	0	1	27	28
Ruby-crowned Kinglet	0	0	2	2
Yellow Palm Warbler	0	0	10	10
White-throated Sparrow	0	0	10	10
Chimney Swift	0	0	26	26
Yellow Warbler	0	0	12	12
Baltimore Oriole	0	0	30	30
Rose-breasted Grosbeak	0	0	4	4
Indigo Bird	0	0	11	11
Catbird	0	0	30	30
Orchard Oriole	0	0	20	20
Kingbird	0	0	27	27
Black-throated Blue Warbler	0	0	1	1
Black-throated Green Warbler	0	0	7	7
Redstart	0	0	4	4
Bobolink	0	0	3	3
Blackburnian Warbler	0	0	1	1
Scarlet Tanager	0	0	3	3
Least Flycatcher	0	0	4	4
Alder Flycatcher	0	0	2	2
Crested Flycatcher	0	0	13	13
Cedarbird	0	0	2	2
Yellow-billed Cuckoo	0	0	5	5
Nighthawk	0	0	7	7
Whip-poor-will	0	0	1	1
White-breasted Nuthatch	0	0	4	4
Bittern	0	0	2	2
Black-poll Warbler	0	0	8	8
Tennessee Warbler	0	0	9	9
Red-eyed Vireo	0	0	13	13
Red-breasted Nuthatch	0	0	2	2
Chestnut-sided Warbler	0	0	4	4
Magnolia Warbler	0	0	9	9

	March	April	May	Total
Wood Pewee	0	0	17	17
Sycamore Warbler	0	0	6	6
Wood Thrush	0	0	2	2
White-crowned Sparrow	0	0	1	1
Bay-breasted Warbler	0	0	5	5
Canadian Warbler	0	0	1	1

1913

	March	April	May	Total
Blue Jay	11	24	25	60
Crow	26	19	17	62
Snowbird	21	28	0	49
Downy Woodpecker	11	17	7	35
White-breasted Nuthatch	11	17	9	37
Tree Sparrow	13	4	0	17
Bluebird	14	24	17	55
Brown Creeper	5	10	0	15
Song Sparrow	17	30	30	77
Meadowlark	11	30	27	68
Robin	22	30	30	82
Killdeer	6	11	14	31
Red-winged Blackbird	3	27	28	58
Phoebe	4	19	9	32
Mourning Dove	2	22	30	54
Cowbird	4	29	27	56
Kingfisher	2	10	6	18
Northern Shrike	1	0	0	1
Bronzed Grackle	19	30	30	79
Field Sparrow	5	26	25	56
Herring Gull	2	0	0	2
Canada Geese	1	0	0	1
Golden-crowned Kinglet	3	6	0	9
Flicker	0	28	25	53
Chipping Sparrow	0	13	28	41
Loggerhead Shrike	0	2	1	3
Red-shouldered Hawk	0	1	1	2
Sparrow Hawk	0	1	0	1
Chickadee	0	1	0	1
Vesper Sparrow	0	19	22	41
Fox Sparrow	0	4	0	4
Towhee	0	15	18	33
Hermit Thrush	0	4	23	27
Sapsucker	0	14	0	14
Barn Swallow	0	2	20	22
Myrtle Warbler	0	11	12	23
Spotted Sandpiper	0	5	20	25
Red-headed Woodpecker	0	2	29	31

	March	April	May	Total
Warbling Vireo	0	3	30	33
Brown Thrasher	0	16	28	44
Ruby-crowned Kinglet	0	9	1	10
Redstart	0	1	4	5
White-throated Sparrow	0	8	8	16
Tennessee Warbler	0	1	0	1
House Wren	0	5	30	35
Goldfinch	0	3	29	33
Red-breasted Nuthatch	0	2	1	3
Baltimore Oriole	0	2	30	32
Yellow Warbler	0	1	18	19
Yellow Palm Warbler	0	8	13	21
Long-billed Marsh Wren	0	1	0	1
Kentucky Warbler	0	0	2	2
Chimney Swift	0	0	29	29
Indigo Bird	0	0	10	10
Catbird	0	0	28	28
Orchard Oriole	0	0	22	22
Kingbird	0	0	23	23
Black-throated Green Warbler	0	0	3	3
Scarlet Tanager	0	0	3	3
Least Flycatcher	0	0	8	8
Alder Flycatcher	0	0	4	4
Crested Flycatcher	0	0	15	15
Cedarbird	0	0	6	6
Yellow-billed Cuckoo	0	0	4	4
Black-billed Cuckoo	0	0	1	1
Nighthawk	0	0	8	8
Whip-poor-will	0	0	1	1
Black-poll Warbler	0	0	11	11
Red-eyed Vireo	0	0	12	12
Magnolia Warbler	0	0	4	4
Wood Pewee	0	0	17	17
Bay-breasted Warbler	0	0	2	2
Ruby-crowned Kinglet	0	0	1	1
Blackburnian Warbler	0	0	1	1
Nashville Warbler	0	0	3	3
Red-breasted Nuthatch	0	0	1	1
Acadian Flycatcher	0	0	3	3
Chestnut-sided Warbler	0	0	13	13
Bobolink	0	0	2	2
Rose-breasted Grosbeak	0	0	7	7
White-crowned Sparrow	0	0	6	6
Canadian Warbler	0	0	2	2
Black and White Warbler	0	0	5	5
Screech Owl	0	0	4	4
Cardinal	0	0	1	1

	March	April	May	Total
Swamp Sparrow	0	0	3	3
Louisiana Water Thrush	0	0	17	17
Blue Gray Gnatcatcher	0	0	1	1
Prairie Warbler	0	0	1	1
Yellow Rail	0	0	3	3
Tree Swallow	0	0	1	1
Blue-headed Vireo	0	0	5	5
Yellow-breasted Chat	0	0	1	1
Yellow-bellied Flycatcher	0	0	1	1
Hummingbird	0	0	1	1
Carolina Wren	0	0	1	1
Maryland Yellowthroat	0	0	1	1

DISTRIBUTION OF OUR BIRDS IN WINTER.

BY BROTHER ALPHONSUS, C. S. C.

The Blue Jay shows irregularity in its distribution in winter. In the first season an approximate equality in the records of the species is shown for the different months; but in the following winter, notably in January, the number of records fell below those of the same months in the preceding year. In 1911-12 there was still greater disparity, the species approaching the high records only in December, and falling far below in January and February. That winter was very severe, which may account for the fewer records of the Jay. The following season, though not very cold, showed a still smaller number of records. The total for the four seasons was 220 records.

The Crow shows regularity of distribution in two of the winter months. In the first two seasons there was the greatest equality, there being a difference of only two records. The severe winter of 1911-12 shows 45 records for the Crow, or 19 fewer than in 1909-10. The winter of 1911-12 did not show a very great increase, the extremely small record for December bringing the total below the average of the first two seasons. The total for the four winters was 222 records, the largest number made for any species.

The White-breasted Nuthatch shows great uniformity in its records for three years. In 1910-11 the species had its largest record, which was almost double that of any other winter. February was the month that showed the least regularity in its

records—4, 7, 17, 24 being the numbers for the various seasons. This Nuthatch, among winter species, ranks third in abundance, having as a total for the four seasons 168 records.

The Snowbird was irregularly distributed, the records obtained showing a marked difference in three winters. In two seasons the species showed regularity as well as scarcity. It is impossible to determine from such inequality in the records whether the species is abundant or not in winter. Future observations may afford the writer the desired information. For the four seasons the Snowbird had a total of 60 records.

The Downy Woodpecker, from the records obtained, is shown to be somewhat rare in winter. There was uniformity in the bird's appearance, the average for each year being about 11 records. The four seasons give a total of 47 records.

The Tree Sparrow shows scarcity in its distribution in winter, 7 records being the average number of each year. The species was irregular also, as the difference of 9 days between the largest and smallest number of records shows. Further observations will likely confirm the writer in his opinion that this species is not abundant in winter. The four seasons totalled 28 records.

The appearance of the Robin in the winter of 1911-12 was unprecedented in the writer's observations. There were 20 records, and most of them were made during the coldest part of the season—from January 17 to February 11. As noted before, in a previous article, this notable event in the bird world was due to the severity of the winter, the birds migrating from the north for food and water.

The Brown Creeper may be placed among the very rare species in winter; for during the four seasons under comparison it did not appear one year, and in two other winters was seen only 5 times. In 1911-12 there were 9 records, making the total for four seasons 14 records.

Among other very rare species were: Evening Grosbeak, seen 3 times in one season; Northern Shrike, recorded twice in one winter; Hairy Woodpecker and Song Sparrow observed once in four years; Snowflake and Bluebird, each seen on 5 days in four seasons; Chickadee, found on 5 days in 1912; Goldfinch, observed twice in 1909; Screech Owl, heard 7 times in three seasons; Cardinal and Herring Gull, recorded once in the winter of 1911-12.

1909-10

	Dec.	Jan.	Feb.	Total
Blue Jay	22	27	28	77
Crow	19	22	23	64
White-breasted Nuthatch	12	11	7	30
Snowbird	11	6	2	19
Downy Woodpecker	11	3	1	15
Goldfinch	2	0	0	2
Tree Sparrow	4	2	2	8
Screech Owl	1	2	0	3
Bluebird	0	0	2	2

1910-11

	Dec.	Jan.	Feb.	Total
Blue Jay	20	17	25	62
Crow	19	23	20	62
White-breasted Nuthatch	18	21	24	63
Evening Grosbeak	2	1	0	3
Tree Sparrow	1	0	4	5
Screech Owl	1	1	0	2
Hell Diver	5	0	0	5
Snowbird	3	5	0	8
Snowflake	1	0	1	2
Downy Woodpecker	1	3	4	8
Goldfinch	0	1	0	1
Brown Creeper	0	0	1	1
Bluebird	0	0	2	2
Chickadee	0	0	2	2
Robin	0	0	2	2

1911-12

	Dec.	Jan.	Feb.	Total
Blue Jay	22	10	14	46
Crow	18	11	16	45
White-breasted Nuthatch	17	15	4	36
Downy Woodpecker	4	4	3	11
Snowbird	6	3	0	9
Tree Sparrow	2	1	9	12
Robin	1	11	8	20
Brown Creeper	8	0	1	9
Screech Owl	2	0	0	2
Song Sparrow	1	0	0	1
Cardinal	1	0	0	1
Snowflake	0	1	0	1
Sparrow Hawk	0	0	1	1

1912-13

	Dec.	Jan.	Feb.	Total
Blue Jay	10	16	9	35
Crow	7	24	20	51
Song Sparrow	1	0	0	1
Chickadee	5	0	0	5
Snowbird	12	10	12	34
Downy Woodpecker	4	6	3	13
Brown Creeper	2	0	1	3
Northern Shrike	1	0	1	2
White-breasted Nuthatch	10	12	17	39
Hairy Woodpecker	0	1	0	1
Tree Sparrow	0	2	1	3
Herring Gull	0	1	0	1
Snowflake	0	0	3	3
Bluebird	0	0	1	1

Total number of species seen in four winters, 23.

NOTES ON OUR LOCAL PLANTS.—X.

BY J. A. NIEUWLAND.

Family 76. **SILIQUSAE** Linn., Phil. Bot., 34 (1751).

Also Ray, Meth. Pl., 119 (1681), Morison, Caesalpinus, in part. *Cruciferae* B. Jussieu, Hort. Trianon, (1759), A. Jussieu, Gen. 67 (1789), DeCandolle, Syst. 11, 139 (1821), Prod. I, 131 (1824). *Cruciformes* Pontedera.

EROPHILA DC. Prod. 1, 172 (1824), Syst. II, 356 (1821).

Draba Linn. Syst. (1735), Gen. 194 (1737), 294 (1754). *Draba* Dillenius, Gen. 122 (1719) in part. *Gansblum* Brunfels, Herb. Viv. Ic. (1531) also Adanson Fam. des Plantes, II, 420 (1763). (Name not Latin).

Erophila verna (Linn.) E. Mey., Gartenfl. Deutsch. ed. 4, 35.

Erophila vulgaris DC. Syst. 1. c., *Draba verna* Linn., Sp. Pl., 642 (1753). Common everywhere very early in spring.

TOMOSTIMA Raf., Neogenyton, 2, (1825).

Drabella Bubani Fl. Pyr., III, 197 (1901), in part, *Draba* Linn. 1. c. in part. Not *Draba* Dioscorides which is *Lepidium* *Draba* Linn.

Tomostima caroliniana (Walt.)

Draba caroliniana Walt. Fl. Car., 174 (1788), *Draba hispidula* Michx. Fl. Bor. Am. II, 28 (1803).

Lake Co. (Hill). 1973 Notre Dame (Powers), 1972 Notre Dame. Common.

ABDRA Greene, Pittonia, IV, 205 (1900).

Draba, Linn., l. c., in part.

Abdra brachycarpa (Nutt.) Greene, l. c.

Draba brachycarpa Nuttall, T. and G., Fl. N. Am. I, 108 (1838).

Lake Co. (Hill). Found also in Laporte, Berrien and St. Joseph Co.

ADYSETON Adanson, Fam. des Plantes, II, 420 (1663). Also *Adysetum* Med., Gen. Pl., 73, t. 1, f. 16. Scop., Fl. Car., 13 (1772), Moench, Meth. Pl., 266 (1794) *Alyssum* Linn., Sp. Pl., 650 (1753), not *Alyssum* Dioscorides which is a species of *Farsetia*. *Alyssum* Galen is *Marrubium*, *Alyssum* Pliny is *Rubia erratica*.

Adyseton alyssoides (Linn.)

Adyseton calycinum (Linn.) Scop., Fl. Car., ed. 2, II, 802 (1772), *Alyssum calycinum* Linn., Sp. Pl., II, 908 (1763), *Alyssum alyssoides* Linn. Syst. l. c. ed. 1130 (1759), *Clypeola alyssoides* Linn. Sp. Pl., 652 (1753).

9207, 9112, 9261, Webster's North of Notre Dame.

LOBULARIA Desv., Jr. Bot., III, 172 (1813).

Konig Adanson Fam. Fl. II, 420 (1763) not a Latin name. *Koniga* R. Brown, App. Denh. Clapp. Narr. Exp. Afr. 214 (1826).

Lobularia maritima (Linn.) Desv. l. c. 169.

Clypeola maritima Linn., Sp. Pl., 652 (1753), *Alyssum maritimum* Lam., Encyc., I, 98 (1783), *Koniga maritima* m. Br. l. c.

THLASPI Dioscorides, 2, 147 (Ruellius' ed.) 189 (1547). *Thlaspi* Linn., Syst. (1735), Gen. 193 (1737), 292 (1754), Type of *Thlaspi* Linn. Sp. Pl., 647 (1753) *Bursa Pastoris* Tour., Els., 46 (1694) I. R. H., 185 (1700), *Bursa Pastoris* Bauhin, C., Pinax, 108. (1623), also *CAPSELLA* C. Bauhin, l. c. *Capsella* Med., Pfl. Gatt., I, 85 (1792), *Bursa* Heucher, Ind. Pl. Hort. Med., Acad. Vit., 14 (1711) Siegs. Pr. Fl. Petrop., 22 (1736) Guet., II, 158., *Thlaspi* Ray, I, 838. *Thlaspi* Gesner, Hort., 284 (1561). *Bursa* Trew, Herb. Blackw., Cent. I, t. 5 (1757), Ludwig-Boehmer, Def. Gen. Pl., 225 (1760), *Marsupicarpus* Necker, El. III, 91 (1790).

Thlaspi fatuum Gesner, Hort. Germ., (1561) also Ray, l. c.

Thlaspi Bursapastoris Hill, Veg. Syst. (1773), *Thlaspi Bursa pastoris* Linn., Sp. Pl., 647 (1753). *Bursa pastoris* Weber, Wigg.,

Prim. Fl. Holsat., 47 (1780), *Capsella pastoralis* Dulac Fl. Pyr., 189 (1867), *Rodschiedia Bursa pastoris* Gaertner, Mey. and Scherb., Fl. Wet., II, 413 (1800). (For other synonyms see Am. Mid. Nat., II, 113).

531 South Bend, Ind.; 1197 Notre Dame, Ind. Common everywhere. Lake Maxinkuckee (H. W. Clarke).

CARDAMINE Dioscorides II : 120.

Nasturtium R. Brown, Ait. Nort. Kew., ed. 2, 109 (1812) in part. *Nasturtium* Pliny 20 : 13, Varro III : 9, Pall., Jan. 14, is *Lepidium sativum* Linn. (?).

Radicula Dillenius, Pl. Giss., 80 (1718) also J. Bauhin, Hist. II, 866, J. Hill, Br. Herb., 265 (1756), *Roripa* Scopoli, Fl. Car., 520 (1760), *Sisymbrium* Dioscorides (Doubtful, thought to be a mint by some) *Cardaminum* Moench Meth., 262 (1794). Also Ruellius *Sisymbrium* Linn., Syst., Gen., 199 (1737), 296 (1754) also Tour., Els., 192 (1694), I. R. H., 215 (1700). *Vella* Galen, *Cressa* Ericius Cordus.

Cardamine aquatica (Hill).

Sisymbrium Nasturtium aquaticum Linn., Sp. Pl., 657 (1753), *Sisymbrium aquaticum* Tour., l. c. *Nasturtium aquaticum* Hill, 1755, also *Sisymbrium vulgare* Br. Herbal, 245 (1756). *Nasturtium officinale* R. Br., Ait. Hort. Kew., ed. 2, IV, 110 (1812). For other synonyms see Am. Mid. Nat., II, 112. *Sisymbrium aquaticum* Matthli, Caesalpinus, Castor Durante, Tabernaemontanus also Tour., Els., 192 (1694) I. R. H., 226 (1700).

South Haven (L. H. Bailey), Laporte Co., (Deam) St. Joseph Co., Ind., Rothert, Lake Maxinkuckee (Clarke), 569 1/2, 2018, 3523, Notre Dame (Powers) 10433, 11189 Notre Dame, 10481 Bertrand, Berrien Co., Mich. Very common and abundant. Not cultivated as in the East, for table use. I have seen it in all the counties.

Roripa Scopoli Fl. Car., 520 (1760).

Radicula Dodonaeus Pempt., 666 (1583) = *Raphanus*. *Radicula* Dillenius Cat., Pl. Giss., 80 (1718) in part, Hill, Br. Herbal 265 (1756). *Nasturtium* R. Br. l. c. in part.

Roripa palustris Bess., Enum., 27 (1821).

Radicula palustris (Linn.) Moench, Meth., 263 (1794) *Sisymbrium amphibium* var. *palustre* Linn., Sp. Pl. 657 (1753), *Nasturtium terrestre* R. Br. l. c., *Nasturtium palustre* DC., Syst., II, 191 (1821).

Lake Maxinkuëkee (H. W. Clarke), 11310 South Bend, Ind., on the Grand Trunk R. R. towards Crumstown. Common in muck ground in the region.

Roripa hispida Britton Mem. Torr. Bot. Cl., V, 169 (1894).

Radicula hispida (Desv.) Britton Torrey, VI, 32 (1908).

Brachylobus hispidus Desv., Jour. Bot. III, 183 (1814), *Nasturtium hispidum* DC., l. c. 201, *Nasturtium palustre* var. *hispidum* A. Gray, Man., ed. 2, 30 (1856).

Lake Co., (Deam).

ARMORACIA Pliny XIX:5.

Also Columella, Lacuna, *Armoracia* Heucher, 13 Weim., 79, t. 170, fig. a. also Rivinus, Ruppius Fl. Jen., 67 (1726), 87 (1745), *Cochlearia* Tour., Els., 183 (1694) l. R. II., 215 (1700) in part also Linn., in part. *Armoracia* Gaertn. Meyer and Schred. Fl. Wett., II, 426 (1800).

Armoracia Rivini Ruppius l. c.

Armoracia rusticana Gaertn. l. c., *Raphanus rusticanus* Camerarius, Gerard C. Bauhin Stapelius, Ray, Plukenett, Morison, *Raphanus rusticus* Camerarius *Raphanus major* Brunfels, Tragus, Gesner.

Escaped extensively and notably at Lakeville.

NEOBECKIA Greene, Pittonia, III, 95 (1896).

Neobeckia aquatica (Eaton) Greene, l. c.

Cochlearia aquatica Eaton Man., ed. 5, 181 (1829), *Nasturtium natans* var. *americana* A. Gray Ann. Lyc. N. U. III, 223 (1836), *Nasturtium lacustre* A. Gray Gen. III., I, 132 (1448), *Roripa americana* Britton, Mem. Torr. Bot. Cl., V, 169, (1894). *Radicula aquatica* Robinson Rhodora X, 32 (1909).

ADYSETON Adanson Fam. des Pl., 420 (1763).

Adyseton Scopoli Fl. Car. 13, (1772), Medik., Gen. Pl., 73, t. I, f. 116, Moench, Meth., 266 (1794). *Allyssum* Linn., Tour, not *Allyssum* Dioscorides = *Farselia* sp. nor *Alyssum* Galen = *Marrubium* nor *Alyssum* Pliny = *Rubia erratica*.

Adyssetum allyssoides (Linn.)

Allyssum allyssoides Linn. Syst., Ed. 10, 1130 (1759), *Clypeola allyssoides*. *Alyssum calycinum* Linn., Sp. Pl., 908 (1763).

9207, 9090, 9261, Webster's N. of Notre Dame. Found also at Notre Dame in dry uncultivated fields.

LOBULARIA Desv., Jr. Bot., 172 (1813).

Koniga R. Br., Denh. and Clapp. Narr. Exp. Afr., 214 (1826),

Konig Adanson, Fam. des Pl., 11420 (1763) not a latin name.

Lobularia maritima (Linn.) Desv. l. c. 169.

Clypeola maritima Linn. Sp. Pl., 652 (1753), *Alyssum maritimum* Lam. Encyc. I, 98 (1783), *Koniga maritima* R. Br. l. c.

Escaped from gardens and sometimes persisting a while.

LEPIDIDIUM Dioscorides, II:166, Pliny, XX:17.

Draba Dioscorides = *Lepidium Draba*. *Cardamon* Dioscorides = *Lepidium sativum*, *Piperitis* Brunfels, *Lonicer*, *Dodonaeus*, French ed. (1557). *Lepidium* Tour., Els., 184 (1694), I. R. H., 215 (1700), *Lepidium* Linn. Syst. (1735) Gen. 192 (1737), 291 (1754), also *Lepidium* Anguillara, Matthioli, *Caesalpinus*, *Gesner*, *Tabernaemontanus*, *Lacuna*, *Dodonaeus*, *Lobelius*, *Gerard*, *Fuchs*, *Tragus*, *Camerarius*, etc.

Lepidium virginicum Linn., Sp. Pl., 645 (1753).

Lake Maxinkuckee (H. W. Clarke), 3567, 3569 Notre Dame (Powers) 2050, 3721 Notre Dame. Common everywhere.

Lepidium densiflorum Schrader, Ind. Sem. Gott., 4 (1835).

Lepidium intermedium A. Gray, Man. ed. 2, (1856).

9650, Oliver's, St. Joseph Co., 10633 Notre Dame.

Lepidium campestre R. Br., Ait., Hort. Kew., ed. 2, IV, 88 (1812).

456 M. C. R. R., near Notre Dame, 6217 (Tidestrom) Notre Dame 10542, 9137 South Bend.

CAMELINA Ruellius, Nat. Stirp., 326 (1543).

Camelina Crantz Stirp. Aust., I, 18, (1762), *Dorella* *Caesalpinus*, De Plant. 367 (1583), *Linostrophon* Schrank, Fl. Prim. Salisb. 163 (1792). *Myagrurn* Diosc?

Camelina sativa Schrank, l. c.

Myagrurn sativum Linn., Sp. Pl., 641 (1753), *Linostrophon sativum* Schrank l. c. *Dorella oleifera* Bubani, Fl. Pyr., III, 252 (1901).

Lake Maxinkuckee (Clarke).

SOPHIA Brunfels, Hist., 3, 170 (1543) *Lobelius*, Icon., 738 (1581).

Also Ray, Hist., I, 812, (1686), *Sophia* *Dodonaeus*, Pempt., 133 (1583), Weinm., Phyt., t. 941, a. (1737) Heist., Ind., 130. Zannich., 252, Ic. 350. Haller, *Accipitrina* *Rivinus*, *Lonicer*, *Ruppius*, Fl. Jen., 64 (1726), 81 (1745), *Seriphium* *Fuchs*, J. Bauhin, *Tragus*, *Chabraeus* etc. *Descurea* Guettaro, Obs., 2, op. 164. Stamp., 2, 164 (1747), *Descuraniia* Webb., and Barth., Phyt.

Can., I, 71 (1836) *Sophia* Trew, Herb. Blackw., t. 440 (1755) also Adanson, Fam. des Pl., II, 417 (1763) *Sisymbrium* Tour. I. R. H., 226 (1700), 192 (1694), Linn. Syst., (3735) Gen. 199 (1737) 296 (1754).

Sophia pinnata (Walt.) Howell, Fl. N. W. Am., I, 56 (1897).

Erysimum pinnatum Walter, Fl. Car., 174 (1788), *Sisymbrium canescens* Nutt., Gen., II, 68 (1818), *Descurainia pinnata* Britton, Mem. Torr. Bot. Cl., V, 173 (1894).

Millers (Higdon and Raddin), Hegewisch, Ind. (Hill), 3525 Notre Dame (Powers) 2068, 2069 St. Mary's, Notre Dame. Found also in a number of other places in this country.

NORTA Adanson, Fam. des Pl., II, 417 (1763).

Norta altissima (Linn.) Britton, Ill. Fl., 2 ed., II, (1913).

Sisymbrium altissimum Linn., Sp. Pl., 659 (1753).

11094, 11248 Notre Dame, Ind., 2680a, 2680b Galien, Mich., Berrien Co., Millers (Umbach).

CHEIRINIA Link, Enum. Hort. Berol., II, 170 (1820).

Cheirinia cheiranthoides (Linn.) Link, l. c.

Erysimum cheiranthoides Linn., Sp. Pl., 661 (1763).

11311, Grand Trunk w. w. west of South Bend, Ind.

ERYSIMUM Dioscorides, II :187, also Pliny, Hist. Nat.

Not *Erysimum* Theophrastus = *Polygonum Fagopyrum* Linn. *Sisymbrium* of modern works, not *Sisymbrium* of the ancients, and Dioscorides which is a mint, probably *Mentha arvensis* Linn.

Chamaeplium Spach, ex Wallr., Sched. Crit. I, 176 (1827), *Phrye* Bubani, Fl. Pyr., III. 171 (1901). *Erysimum* Linn., Syst. (1735), Gen. 198 (1737), 296 (1754) Tour. Els. 194 (1694), I. R. H. 228 (1700). also Gerner, Dodonaeus, Gerard, Thalinus. Tragus, Morison, Boerhaave, etc. *Iris* Dodonaeus, Hist. ed. Gall. 438 (1557).

¹Bubani does not think that the *Erysimum* of Dioscorides is indubitably the *Erysimum officinale* of Linnaeus (Fl. Pyr. III, 179). Fraas in his Flora Classica to another species of the genus refers the Dioscorean name. *Sibthorp* (Fl. Graec) refers the *Erysimum* in question to *Sisymbrium polyceratum* Linn. The consensus of the older pre-Linnaean is so general that even Bubani admits that the plant of Dioscorides is probably *E. officinale* Linn. though he himself changed the name to *Phryne* not wishing to accept only probable ancient names. We do not see sufficient reason for any other view and have retained *Erysimum* though there was another Theophrastan one. Our reasons for this were explained in the introduction to these notes.

Erysimum vulgare Bauhin, Pinax, 100 (1623).

Erysimum vulgare Morison, Hist. II, 218, Boerhaave, Lg d., II, 14. Tour., l. c. *Erysimum officinale* Linn., Sp. Pl., 660 (1753), *Sisymbrium officinale* Scop. Fl. Car., ed. 2, II, 26 (1772), *Klukia officinalis* Andrz. ex DC. Syst., II, 460 (1821). *Erysimum vulgatum* C. Bauhin, Phytopinax, 152 (1596).

Lake Maxinkuckee (Clarke). A common weed seen throughout the whole region.

HESPERIS Pliny, XXI:7.

Hesperis Clusius, Camerarius, C. Bauhin, Pinax, 202 (1623). Tour. Els. 190 (1694) I. R. H., 222 (1700), Linn., Syst., (1735), Gen. 195 (1737), 297 (1754). *Deilosma* Andrz., DC., Syst., II, 448 (1813), *Antoniana* Bubani, l. c. 170.

Hesperis hortensis C. Bauhin, Pinax, 202, (1623) also Phytopinax 379 (1596).

Hesperis hortensis Tour., l. c. Morison, Ray, Magnol. etc. *Hesperis vulgaris* Parkinson, Parad., 163 (1629), *Deilosma inodora* Andrz., l. c. *Hesperis euganea* Marsil., ex Ten. Prod. Fl. Nap. p. 39. *Hesperis matronalis* Linn., Sp. Pl., 663 (1753). *Hesperis matronalis* Chabreaus, Sciag., 280 (1677) and Index.

11122, Notre Dame, Ind. Escaped along the banks of the St. Joseph River from the St. Mary's Academy Gardens. The white flowered variety as also the common purple flowered plant is found in great abundance in the low land south of Buchanon, Mich. (Berrien Co.)

Arabidopsis (DC) Schur., Enum. Pl. Trans., 55 (1866).

Pilosella Thalius, Fl. Herc., 84 (1588) not *Pilosella* of the older authors Dodonaeus etc., nor *Pilosella* Thalius, l. c. 83 (1588), *Stenophragma* Celak., Flora. IV., 438 (1872).

Arabidopsis thaliana (Linn.) Schur l. c.

*Arabis thaliana*² Linn., Sp. Pl., (1753), *Sisymbrium thalianum*

²It is incorrect to write the second name *thaliana* with a capital letter. Linnaeus used such capital letters for the trivial names of old genera reduced by him from their original standing. Thus, e. g. *Erysimum Barbarea* meaning the *Erysimum* that formerly constituted the genus *Barbarea*. There is no record of any application of a genus *Thaliana*. Moreover even Linnaeus does not write the name *Arabis Thaliana* as the manual makers would have us believe but *Arabis thaliana* Linn. Sp. Pl., l. c. It is therefore, a falsehood to attribute the name to him, but such things are frequently done and often with questionable motives. (See Am. Mid. Nat., II., 97) (Britton and Brown Flora III., II., 197 [1913]). The plant was so named in honor of Thalius who first described it. (l. c.)

Gray, Ann. Sci. Nat., VII, 399 (1826), *Stenophragma thaliana* (?) Celakowski, Oester, Bot. Zeitsch., XXVII, 177 (1877) *Pilosella siliquata* Thalius, l. c. also Camerarius. *Pilosella siliquosa* Chab., Sciagr., 277, f. 4 (1677).

9114, 9129, 11076, 1175, 11757, 11023, 2538, 2545, Notre Dame, Ind., 3520, 2049 Notre Dame, (Powers).

BARBAREA Dodonaeus, Pempt., 5:4:20 (1583) also Lobelius Obs., 104 (1576).

Barbarea R. Br., Ait. Hort. Kew., 2 ed. 4, 109 (1812). Reduced by Linnaeus to *Erysimum* (*Herba S. Barbarae* Lon., Cast. Fuchs, Gesner) *Scopa regia* Fuchs, Ang.

Barbarea vulgaris R. Br., l. c.

South Haven, Berrien Co. (Bailey), 27, Bertrand, Mich. 2198 Notre Dame.

Barbarea stricta Andrz. Bess., Enum. Pl. Volh., 72 (1821).

Barbarea vulgaris var. *stricta* A. Gray, Man. ed. 2, 35 (1856) Notre Dame, Ind.

TURRITIS Lobelius, Icones, (1591) also Dillenius, Gen., 120 (1719) Linn. Syst. (1735) *Arabidium* Spach. Hist. Nat. Veg. VI, 436 (1836). *Turritis* and *Arabis* Linn., Gen. 198 (1737), 298 (1754). *Arabis* Linn., Sp. Pl., 664 and *Turritis* Linn., l. c. 666 (1753), *Turrita* and *Turritis* Bubani, l. c., 152. The *Arabis* of the pre-Dillenian and pre-Linnaean writers, and the first to use the name *e. g.* Matthioli and Anguillara, was *Lepidium Draba* Linn

Turritis spathulata (Michx.)

Arabis lyrata Linn., Sp. Pl., 665 (1753), not *Turritis lyrata* Raf., Am. Month. Mag. II, 44 (1817), = *Arabis canadensis* Linn.

Laporte Co. (Barnes) (Deam), Lake Co. (Barnes, Deam and Hill), South Haven (Bailey) 443, 20401, Notre Dame, Ind.

Turritis hirsuta Linn., Sp. Pl., 666 (1753).

Arabis hirsuta (Linn.) Scop., Fl. Car., ed. 2, II, 30 (1772).

9233, 2792, Notre Dame, 2027, 2010 Notre Dame (Powers).

Turritis laevigata Muhl., ex Willd., Sp. Pl., III, 543 (1800).

Arabis laevigata Poir., Lam. encyc., Suppl., I, 411 (1810).

405, 2526, 2551, 1839, Notre Dame, 2028 Notre Dame (Powers) Lake Maxinkuckee (Clarke).

Turritis canadensis (Linn.)

Arabis canadensis Linn., Sp. Pl., 665 (1753).

Lake Co. (Hill), Lake Maxinkuckee (Clarke). 2029 Notre Dame (Powers), 11360 Notre Dame, Ind.

Turritis stricta Graham, Edinb. New Phil. Jr., 350 (1829).
Arabis Drummondii A. Gray, Proc. Am. Acad., VI., 187 (1866).
 9253, 11069 Notre Dame, Ind.

Turritis brachycarpa T. and G., Fl. N. Am. I, 79 (1838).
Arabis brachycarpa (T. and G.) Britton, Mem. Torr. Bot
 Cl., V. 174 (1894).

405 Notre Dame, Ind.

DRACAMINE Nwd., Nom. Nov.

Cardamine Clusius, Haller, Lobellius, Gerard, Linnaeus,
 Syst (1735), Gen., 196 (1737), 295 (1754), Tour., Els., 191 (1694),
 I. R. H., 224 (1700), not *Cardamine* Dioscorides, which is *Sisym-
 brium Nasturtium aquaticum* Linn. *Ghinia* Bubani l. c. 158, not
Ghinia Schreb., Gen. 19 (1789).

Dracamine pennsylvanica (Muhl.)

Cardamine pennsylvanica Muhl., Willd., Sp. Pl., III, 486
 (1800).

2001, 2002, Notre Dame (Powers), Lake Maxinkuckee
 (Clarke), 483, Edwardsburg, Mich., 525 South Bend, Ind., 9111
 Websters N. of Notre Dame. Van Buren Co. Mich. (Pepoon).

Dracamine pratensis (Linn.)

Cardamine pratensis Linn., l. c. 656 (1753), *Ghinia pratensis*
 Bubani, l. c. 163.

Lake Co. (Hill), Millers (Bastin and Hill), Lake Maxinkuckee
 (Clarke).

Dracamine purpurea (Torr.)

Cardamine purpurea (Torr.) Britton in Britton and Brown,
 III. Fl., II, 139, (1897), *Arabis rhomboidea* var. *purpurea* Torr.,
 Am. Jr. Sc., IV., 66 (1822), *Arabis Douglassii* Torr., T. and G.,
 Fl. N. Am., I, 83 (1839), *Cardamine Douglassii* Britton, Trans.
 N. Y. Acad., Sc IX, 8 (1889).

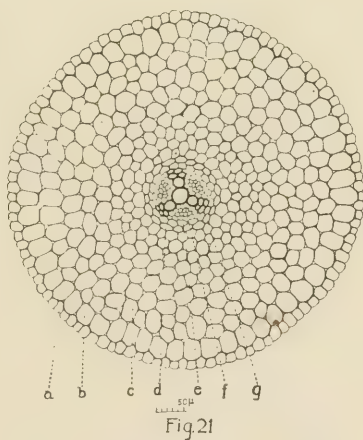
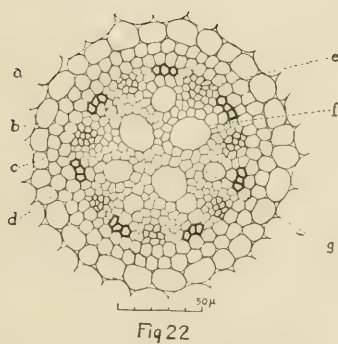
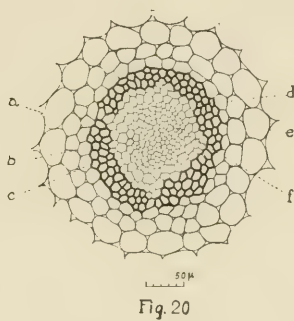
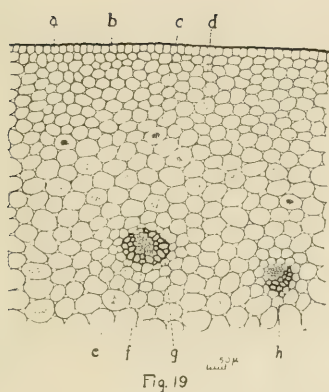
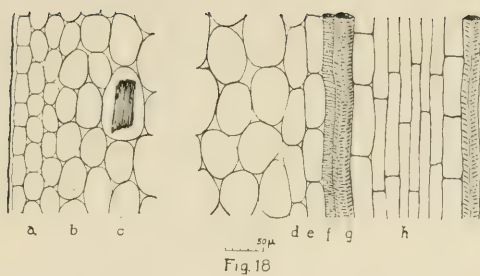
Laporte Co. (Deam), St. Joseph Co. (Rothert), 2010 Notre
 Dame (Powers), 1999, 1836, 11105, 11161, Notre Dame, 9382,
 9218 Benton Harbor, Mich.

Dracamine bulbosa (Schred.)

Cardamine bulbosa Schreber, Muhl. Trans. Am. Phil. Soc.
 III, 174 (1793), *Cardamine rhomboidea* DC., Syst. Veg., II, 246 (1821).

Clarke, Ind., Lake Co., (Umbach), Lake Maxinkuckee
 (Clarke). Very common and abundant throughout the region
 as is the preceding plant.

(To be continued.)



THE AMERICAN MIDLAND NATURALIST

Devoted to Natural History, Primarily
that of the Prairie States

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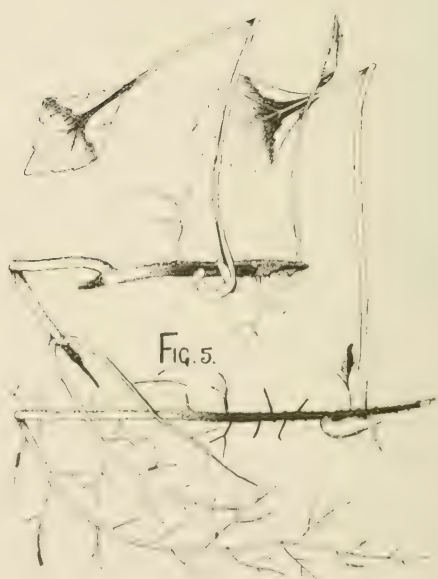
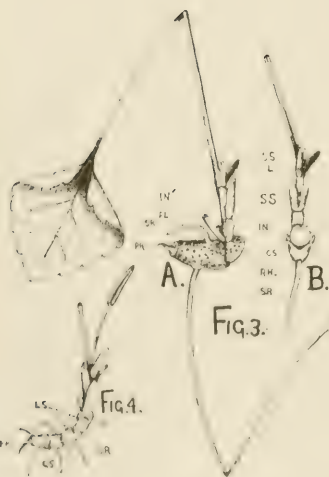
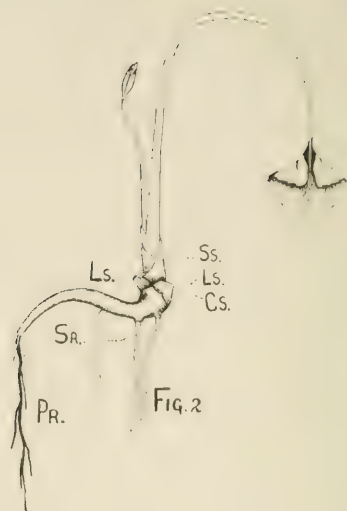


PLATE IV. KACZMAREK ON CROCION.

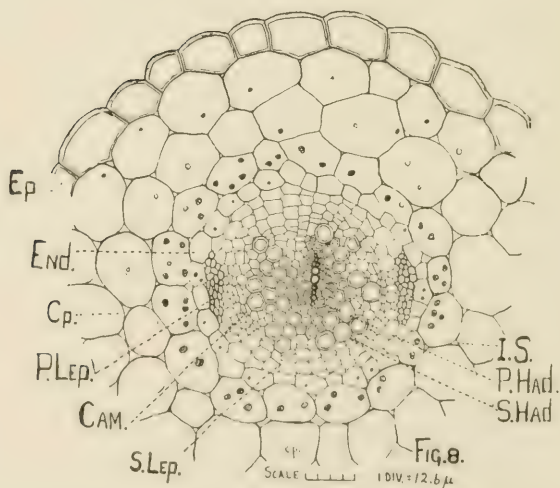
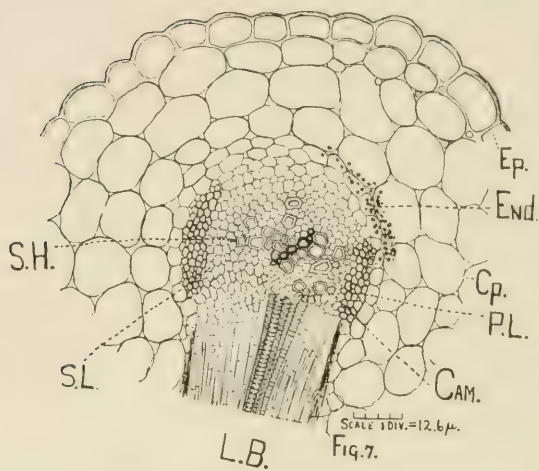
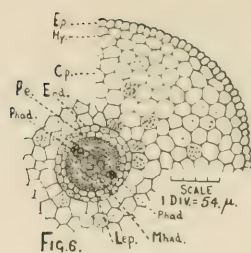
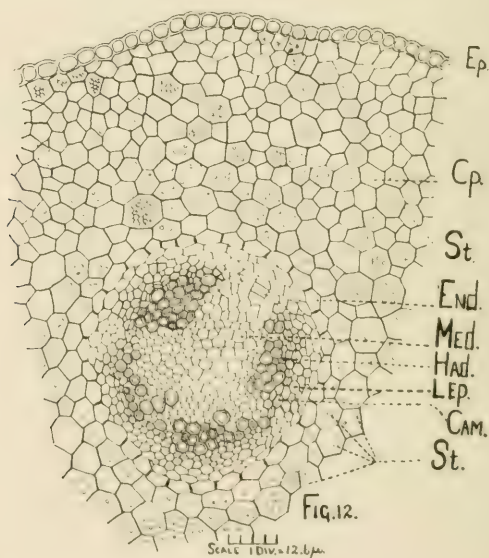
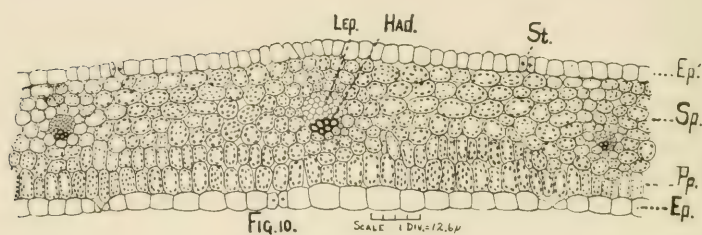
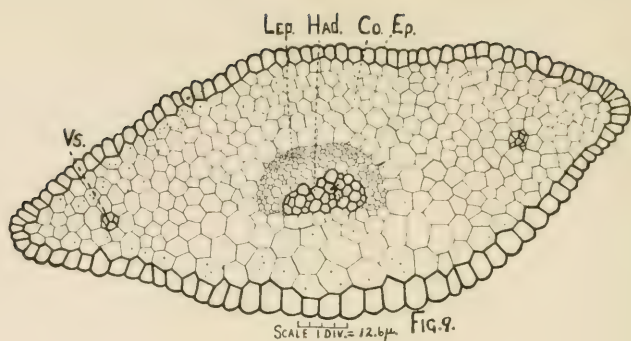
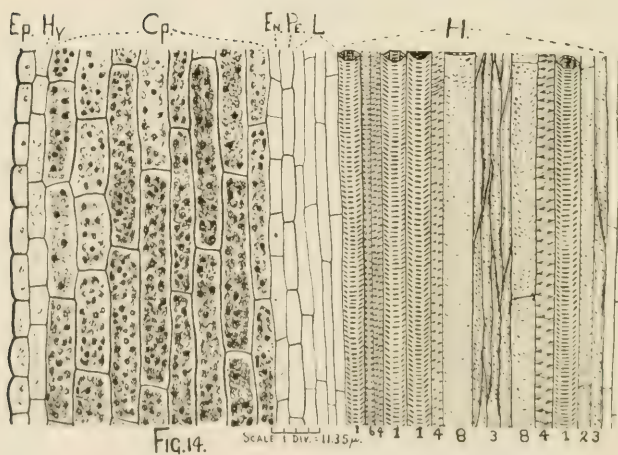
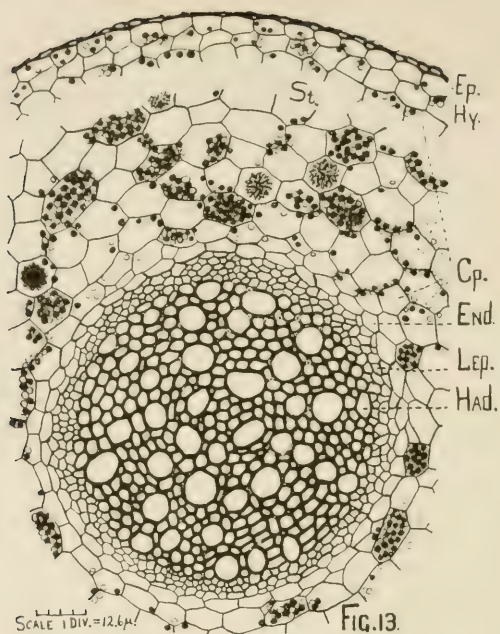


PLATE V. KACZMAREK ON CROCION.





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MAY, 1915.

NO. 3.

THE NAIADES OF MISSOURI.

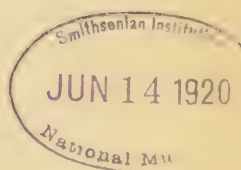
BY WILLIAM I. UTTERBACK.

(Plates i—xxviii.) New Series.

Introduction.

After some years of intensive studies in the field, library and laboratory an attempt is made to give a catalogued account of the *Naiades*, or Fresh-water Mussels, of Missouri. Most of the data for this descriptive and illustrated catalogue have been collected through extensive, personal surveys of the most important streams and lakes of the State and now the typical anatomical and shell material from the different localities are preserved in the writer's laboratory. No literature of any consequence, dealing with the *Naiades* of Missouri, had been produced until the author of this paper made a preliminary report on "The Mussel Resources of Missouri." This was, however, a government report, published for economic purposes, the detailed account of the scientific observations of which will not appear until a later date.

The plan of classification, based on anatomical structures, notably those of marsupial characters, has been carefully followed in this work. The many changes in the nomenclature of this catalogue from that of the Simpsonian system are due especially to the recognition of Lindahl's orthographic modification and of the wise scheme of taxonomy for the *Naiades* begun by Sterki (1906) and well consummated by Ortmann (1912); and also to the acceptance of Rafinesque's priority as recently revived by Mr. Frierson and accepted by Dr. Ortmann. The writer believes that the ultimate taxonomic system will be based far more upon the anatomical structure of juvenile and adult than upon their shell characters from the fact that the soft parts are more constant



morphologically and less liable to parallelism and convergence. We should not, however, lose cognizance of the importance concerning shell characters. External factors may so shape the shell, as to individualize it, but, under normal conditions, do not often destroy all traces of indentification with some group. Since validity is so dependent upon the examination of both hard and soft structures of large series of individuals, it is felt that the species, as recorded for their extensive and intensive studies herein, are fairly well settled within their genera. Fortunately extensive field work has made this intensive study possible. On one occasion the rare opportunity was given the author to make a mussel survey of three hundred miles down the Osage River in a row boat and ample time was given to the study of one of the richest faunae of Missouri. Two papers, "Mussel Studies Afield" for the years 1913 and 1914, are now in MS. recorded matter of which is submitted herewith. The ecologic facts secured in these field surveys are especially interesting. For example, in the long trip down the Osage, the largest tributary of the Missouri in the interior of this state, it was found that the flat or compressed forms found at the headwaters, where the water is shallower and swifter, become more swollen and heavier shells further down stream where the water is deeper and more sluggish. The most valuable data gathered from these field excursions are the ecologic as illustrated in Plates x—xiv. Much physiologic and morphologic information, however, has been obtained from these immediate studies in nature that could not be secured otherwise, since actual observation have been made of the animal carrying on the nutritive and reproductive functions there as well as observed through aquarium studies (See Plate ix). More accurate idea of the morphology (especially of soft parts as to color, form, etc.) is obtained while the specimens are fresh and uncontracted as examined afield.

While this catalogued account is rather synoptical as to the text of its animal and shell characters, yet it has been the effort to be more complete than those literary works of somewhat similar character that have devoted more space to the structures of the shell; hence, much description will be found to be completely given for the first time, notably those of *M. heros* (Say), *O. quadrula* (Raf.) *P. Utterbackii* Frierson, *R. tuberculata* (Raf.), *U. tetralasma* (Say), *Las. suborbiculata* (Say), *Prop. capax* (Green),

Eur. (M.) brevicula (Call), *T. Curtisii* Frierson and Utterback, and *T. Lefevrei* Utterback. Aside from the morphological synopsis of the nutritive and reproductive parts and also of the external and internal features of the shell the physiological and ecological facts are especially dwelt upon in the miscellaneous remarks. Because of the value of beak sculpture and glochidial characters as bases for classification a special feature is respectively made of the studies of juveniles and glochidia. Likewise, for classificatory reasons, a Breeding Record has been kept for the most representative generic types, and, in many instances, more complete records have been made by other observers due to more detailed observations during the winter season. This Record and also the Zoögeographic account of the *Missouri Naiades* have been carefully kept in tabulated form, but, as these accounts have been reserved thus for other special papers, they will only appear here in extracts.

In this catalogue eighty species and twenty subspecies are listed. Doubtless this list will be supplemented, although the author has worked the State rather thoroughly in actual field investigations—especially Central and Northwest Missouri—and has examined all species catalogued except the following which have been reported by Missouri collectors:—*An. Bealii* (Lea), *Cy. Aberti lamarckiana* (Lea), *Pleu. plenum* (Lea), *Lamp. reeviana* (Lea) and *Lamp. Powellii* (Lea). According to a report from the material sent away for identification, this State can claim another species not yet on the list,—a new and undescribed *Lampsilis*, near to *Lamp. biangulata* (Lea), and will soon appear under the authorship of Mr. Frierson.

The author wishes to express his thanks to those who have assisted him in this work. Especially is he thankful to Dr. George Lefevre who assigned and directed this work and rendered it possible through his numerous kindnesses and suggestions. Much credit should also be given Dr. W. C. Curtis, the co-worker with Dr. Lefevre, in the University of Missouri, Department of Zoölogy, where the author gathered much of his data through the facilities of the laboratory, library and museum. Besides the invaluable instructions received from these two gentlemen, who have contributed so much to the Science of Fresh-water Mussels, it was the author's pleasure to receive many valuable hints in person from Dr. R. E. Scammon, author of "Kansas

Unionidae." For other personal help while attending the University thankful acknowledgements are due to Dr. R. L. Moodie, Messrs. G. T. Kline and F. A. Simpson. Under the illustrations of the new species (Plates v and vi) credit is given Mr. Kline, the University Artist-technician, for his excellent drawings. Through the kindness of Mr. Sampson, author of the "Mollusca of Missouri" (Exclusive of the *Unionidae*), permission has been given to examine his collections of mussel shells and make use of his list for same in determining geographic distribution and in confirming the reports of other Missouri collectors. Mr. B. F. Bush, a well-known scientist, and resident of Courtney, Mo., has rendered invaluable aid in sending for study immense collections taken mostly from the Ozark region where the author has not been permitted to carry on such exhaustive field studies as in the northern part of the State. Material from Missouri, contributed to the author's collection by Messrs. C. C. Crouch of LaGrange, E. J. Palmer of Webb City and D. K. Gregor of Fulton, has been thankfully acknowledged. The writer is deeply indebted to old collectors and authors, who were former residents of this State, viz:—Messrs. C. T. Simpson, W. A. Marsh, Elwood Pleas and Dr. John H. Britts; also to those students of *Naiades* for the nearest surrounding States viz:—Dr. F. C. Baker of Illinois, Rev. W. E. Wheeler of Arkansas, Dr. D. H. Wolcott of Nebraska, Dr. Junius Henderson of Colorado, Prof. F. B. Isely of Oklahoma and Drs. R. E. Coker, Thaddeus Surber, A. D. Howard, Prof. H. Walton Clark of Iowa. The last four named students are of the personnel of the U. S. Fisheries Biological Laboratory, located along the Mississippi at Fairport, Iowa, where the author has done some study and has had pleasant personal contact with these gentlemen who have contributed so much to the science of Fresh-water Mussels. Besides being under obligations to the above-named for their literary and conchological exchanges, as well as for their valued correspondence and actual personal assistance, special mention would also be made of Drs. A. E. Ortmann, V. Sterki, C. B. Wilson, W. H. Dall, Harold Hannibal and Messrs. B. H. Wright, Bryant Walker and L. S. Frierson. The author is most grateful to Dr. Ortmann as an authority concerning the soft parts, to Mr. Walker for his treatment of the shell parts and to Mr. Frierson for his general knowledge of *Naiades* as well as for his special information concerning the Southwest forms. Through

very pleasant and extensive correspondence with these last three named gentlemen many problems have been solved and all novelities and changes have passed through their censorship.

In order to elucidate the references in the text made to the physiography and geography an excerpt of the geographic distribution and also a tabulated Account of the Mussel Faunae of Missouri are given here, although, when it is possible to secure the desired data, it is the intention of the author to give *a detailed account of the zoogeography of the Naiades of Missouri and adjacent territory in relation to the restoration of the ancient geographic conditions of Central Mississippi Valley.*

In this connection the hydrography of the State may also be given for the sake of clearness in the use of the text. The drainage to the Mississippi is mostly through the Missouri River which flows entirely across the State just above the central line, and because of the loess soil held in suspension, together with its shifting sand bars and mud beds, it forms "*a great faunal barrier.*" Hence we may account for such a distinct mussel fauna north of the Missouri (known as "Old Muddy") from that south of it. The depauperization of mussel life is remarkable as noted in this river, together with that of the Mississippi from the mouth of the Missouri to a point below the southern boundary line of the State. The chief river basins of North Missouri belonging directly to this faunal barrier are the Chariton, the Grand, the Platte, the Nodaway and other minor ones of the Northwest. A chain of lakes, formed by the changing of the Missouri River channel into "ox-bow cut-offs," are found mostly in the north-western part of the State along the Missouri in its eastern and northern flood-plains. The largest river basins draining into the Missouri River from the south are the Osage, Gasconade and Black-water. The most important one which drains directly into the Mississippi from this State is the Meramec. The chief basins found on the south slope of the Ozarks are the White, Black and St. Francis Rivers which are drained into the Mississippi through Arkansas. South-west Missouri drains into the Mississippi River partly and directly through the Neosho.

The following is a Classified Account, (although apparently contrary to the geologic facts, yet self-explanatory), showing the distinct mussel faunae of the State that coincide with the different

physiographic provinces because of their different ecological conditions, namely, the muddy, sluggish streams of the north, swift, clear-water streams in the south and the mediocre streams of the Central portion:—

a = Prairies; *b* = Mo. and Miss. R's (Proper); *c* = Ozark Uplift.

I.—NORTH MISSOURI = Primitive Mussel Fauna.

1.a—New Prairies, or Glacial Plains. (N. and N.W.Mo.)

1.b—Missouri-Mississippi Flood-plains = Mo. Lakes and Miss. R. (Proper) to mouth of Mo. R. (N. E. Mo.).

Mo. R. (Proper) = Depauperated Mussel Fauna.

II.—CENTRAL MISSOURI = Intergraded Mussel Fauna.

2.a—Old Prairies of W. Central Mo.

1.c—Ozark Border, or North Slope.

III.—SOUTH MISSOURI = Modern Mussel Fauna.

2.c—Ozark Plateau.

3.c—Ozark Center, or South Slope.

2.b—Miss. R. (Proper) below mouth of Mo. R. and Miss.

Lowlands of S. E. Mo. = Depauperated Mussel Fauna.

The Species and Sub-Species, listed under the following general **Key to the Missouri Naiades**, are assigned to the different sub-physiographic provinces where they predominate by employing to the *extreme right after their names the lettered numbers* of the above Classified Account: e. g., **Amblema rariplicata** (Deshayes)—1.a.,—thus indicating the **New Prairies Fauna** where mostly found.

General Key for Identification of the Missouri Naiades.

This key is for very general use, being based upon the essential reproductive and nutritive characters of the animal parts for the Families, Sub-Families and Generic Groups. These characters are indicated under the lettering in the Scheme below and the enumeration of all *Naiades* for Missouri is denoted both by the Roman and Arabic numerals. The geographic distribution of the Species and Sub-Species is indicated by the lettered numbers. The following Scheme of progressive classification is employed:—

A.—FAMILY I.

(A).—SUB-FAMILY (I).

a.—GENUS I.

(a.).—GENERIC GROUP AND SUB-GENUS (I).

1.—SPECIES.

(1).—SUB-SPECIES.

A.—Gills with no water-tubes, septa incomplete, obliquely arranged; gill-

diaphragm incompletely formed; supra-anal absent, branchial and anal openings suppressed with no tendency to a siphonal form; all four gills both respiratory and marsupial; post-ventral margin of mantle undifferentiated; glochida semi-circular, ventral margin with irregular dentations; tachytictic, or short period ("Summer") breeders.

FAMILY I. MARGARITANIDAE Ortmann.

a.—Gill septa oblique from base of gills, more vertically arranged and shorter ventrad.....Genus I. CUMBERLANDIA, Ortmann

1.—*C. monodonta* (Say)—(1. c).

B.—Gills always with water-tubes, septa complete and parallel with gill filaments; gill-diaphragm complete; branchial and anal openings usually tend toward a siphonal form; all four gills or only outer, or parts of outer, marsupial; glochida generally suboval, spadiform, celtiform, spined or spineless.....FAMILY II. UNIONIDAE, Swainson

(A).—Connection between anal and supra-anal openings short or absent; inner laminae of inner gills free from visceral mass; post-ventral margin of mantle not specialized; marsupial undifferentiated, not distended when gravid; glochidia suboval, spineless, tachytictic for the most part.....

..... Sub-Family (I), UNIONINAE, Ortmann

a.—All four gills marsupial.

(a)—Conglutinates club-shaped, pinkish, solid; beak sculpture concentric and slightly nodulated at base of post-umbonal ridge; disk unsculptured....Genus II. FUSCONAIA Simpson

2. *F. undata* (Barnes)—(1. b)

(1). *F. undata trigona* (Lea)—(1. c)

(2). *F. undata trigonoides* Frierson—(1. a)

3. *F. flava* (Raf.)—(3. c)

4. *F. hebetata* (Conrad)—(1. c)

5. *F. ebena* (Lea)—(1. b)

(b)—Conglutinates leaf-like, compressed, subsolid white; beak sculpture concentric, extending zigzag out on disk which is greatly sculptured.....Genus III AMBLEMA (Raf.)

6. *A. peruviana* (Lamarck)—(1. c)

7. *A. rariplicata* (Deshayes)—(1. a)

8. *A. perplicata* (Conrad)—(3. c)

(3). *A. perplicata Quintardi* (Cragin)—(1. c)

9. *A. (plicata) costata* (Raf.)—(1. a)

Genus IV. MAGNONAIAS Utterback.

10. *M. heros* (Say)—(1. a)

Genus V. QUADRULA (Raf.)

11. *Q. pustulosa* (Lea)—(1. b)

(4). *Q. pustulosa schoolcraftensis* (Lea)—(1. a)

(5). *Q. pustulosa asperata* (Lea)—(1. c)

12. *Q. quadrula* (Raf.)—(1. b)

(6). *Q. quadrula contraryensis* Utterback—(1. a)

13. *Q. nodulata* (Raf.)—(1. b)
14. *Q. fragosa* (Conrad)—(1. b)
15. *Q. aspera* (Lea)—(1. c)
16. *Q. nobilis* (Conrad)—(2. a)
17. *Q. verrucosa* (Raf.)—(1. c)
18. *Q. metanevra* (Raf.)—(1. c)
- (7). *Q. metanevra Wardii* (Lea)—(1. b)
19. *Q. cylindrica* (Say)—(3. c)

b.—Only outer gills marsupial.

(a)—Supra-anal opening absent; beak sculpture zigzag; disk greatly sculptured.....Genus VI. ROTUNDARIA (Raf.)

20. *R. tuberculata* (Raf.)—(1. c)
21. *R. granifera* (Lea)—(1. b)

(b)—Supra-anal present but short; beak sculpture concentric but disappearing toward disk which is mostly unsculptured.

Genus VII. PLETHOBASUS (Simpson)

22. *P. cooperianus* (Lea)—(2. c)
23. *P. aesopus* (Green)—(1. b)

Genus VIII. PLEUROBEMA (Raf.)

24. *P. obliquum* (Lamarck)—(1. b)
- (8). *P. obliquum plenum* (Lea)—(3. c)
- (9). *P. obliquum pyramidatum* (Lea)—(1. c)
- (10). *P. obliquum catillus* (Conrad)—(1. c)
- (11). *P. obliquum coccineum* (Conrad)—(1. c)
25. *P. catillus* (Conrad)—(3. c)
26. *P. coccineum* (Conrad)—(3. c)
27. *P. missourense* (Marsh)—(3. c)
28. *P. Utterbackii* Frierson—(3. c)

Genus IX. ELLIPTIO (Raf.)

29. *E. nigra* (Raf.)—(2. c)
30. *E. dilatata* (Raf.)—(2. a)
- (12). *E. dilatata subgibbosa* (Lea)—(3. c)
- (13). *E. dilatata delicata* (Simpson)—(3. c)

Genus X. UNIONERUS (Conrad)

31. *U. tetralasma* (Say)—(1. a)
- (14). *U. tetralasma comptodon* (Say)—(1. a)

(B).—Mantle connection between anal and supra-anal openings always present, very long and moderate; inner laminae of inner gills usually free from the visceral mass; marsupia occupying entire outer gills only, distended ventrad and with lateral water-tubes when gravid; post ventral margin of mantle not differentiated; glochidia subtriangular, or spadiform, spined; bradytic or long period ("Winter") breederSub-Family II. ANODONTINAE Ortmann

a.—Inner laminae of inner gills free from visceral mass; beak sculpture coarse, double-looped.

(a)—Mantle connection between anal and supra-anal openings moderately long; hinge rather complete, shell sculptured and somewhat thick.....Genus XI. SYMPHYNOTA (Lea)

32. *S. complanata* (Barnes)—(1. a)

33. *S. costata* (Raf.)—(3. c)

Genus XII. *ARCIDENS* Simpson)

34. *A. confragosus* (Say)—(2. c)

(b)—Mantle connection between anal and supra-anal openings very long; hinge completely absent; disk smooth; shell thin.

Genus XII. *LASTENA* (Raf.)

35. *L. suborbiculata* (Say)—(1. b)

36. *L. ohiensis* (Raf.)—(1. b)

Genus XIV. *ANODONTA* (Lamarck)

37. *A. grandis* (Say)—(1. b)

38. *A. dakotana* Frierson —(1. b)

39. *A. corpulenta* Cooper—(1. b)

40. *A. Danielsii* Lea—(1. a)

41. *A. Bealii* Lea—(1. 2c)

(c)—Mantle connection between anal and supra-anal openings moderately long; hinge almost absent; shell rather thin, disk unsculptured.....Genus XV. *ANODONTOIDES* (Simpson)

42. *A. ferussacianus* (Lea)—(1. b—)

b.—Inner laminae of inner gills with tendency to connect with visceral mass; mantle connection between anal and supra-anal openings moderate; beak sculpture, heavy, concentric.

(a)—Marsupium with simple ovisacs; hinge teeth rather well developed with cardinals sharp and prominent.

Genus XVI. *ALASMIDONTA* (Say)

43. *A. calceolus* (Lea)—(3. c)

44. *A. marginata* Say—(2. c)

(b)—Marsupium with transverse ovisacs; hinge rudimentary with cardinals rounded and suppressed. . Genus XVII. *STROPHITUS* (Raf)

45. *S. edentulus* (Say)—(2. a)

(C)—Mantle connection between branchial and anal openings present, never very long; inner laminae of inner gills rarely ever entirely free from visceral mass; post-ventral margin of mantle usually highly differentiated with papillae, flaps, etc.; part of outer gills in most genera specialized as marsupia, which, when gravid, bulging beyond original edge of gills, ruptured at ventral edge of ovisacs for escape of larvae; glochidia semi-circular, (*LAMPSILIS* type), or axe-head shape (*PROPTERA* type), ventral margin rounded, rarely spined; bradyticic.

Sub-Family III. *LAMPSILINAE* Ortmann.

a.—Marsupium with subcylindrical ovisacs; post ventral margin of mantle smooth; shell sometimes with disk sculptured, sex dimorphism of shell not distinct.

(a)—Marsupium occupying almost entire outer gill, edges folded, ovisacs several, small, short....Genus XVIII. *ELLIPSARIA* (Raf.)

46. *E. clintonensis* (Simpson)—(3. c)

(b)—Marsupium occupying outer gill in a few, large, long ovisacs.

Genus XIX. *OBLIQUARIA* (Raf.)

47. *O. reflexa* (Raf.)—(1. c)

Genus XX. CYPROGENIA (Agassiz)

48. *C. Aberti* (Conrad)—(3. c)(15). *C. Aberti lamarckiana* (Lea)—(3. c)

b.—Marsupium with compressed and dilated ovisacs; post ventral margin of mantle smooth to papillose; shell generally without disk sculpture, sex dimorphism usually very distinct.

(a)—Inner post-ventral edge of mantles without flap or papillae, but slightly lamellate and crenulated; glochidia elliptic and celtiform, when normal in shape either extremely large or small.

Genus XXI. OBOVARIA (Raf.)

Sub-Genus (I)—PSEUDOON (Simpson)

49. *O. (Pseudoon) ellipsis* (Lea)—(1. b)

Genus XXII. NEPHRONAIAS (Cross and Fisher)

50. *N. ligamentina* (Lamarck)—(1. b)(16). *N. ligamentina gibba* (Simpson)—(1. c)51. *N. ellipsiformis* (Conrad)—(1. c)(17). *N. ellipsiformis venusta* (Lea)—(1. c)52. *N. Pleasii* (Marsh)—(3. c)53. *N. ozarkensis* (Call)—(3. c)

Genus XXIII. AMYGDALONAIAS (Cross and Fisher)

54. *A. donaciformis* (Lea)—(1. a)55. *A. truncata* (Raf.)—(1. c)

Genus XXIV. PLAGIOLA (Raf.)

56. *P. securis* (Lea)—(1. b)

Genus XXV. LASMONOS (Raf.)

57. *L. fragilis* (Raf.)—(1. a)58. *L. Simpsonii* (Ferriss)—(3. c)59. *L. leptodon* (Raf.)

Genus XXVI. PROPTERA (Raf.)

60. *P. alata* (Say)—(1. a)61. *P. purpurata* (Lamarck)—(3. c)62. *P. laevissima* (Lea)—(1. a)63. *P. capax* (Green)—(1. b)

(b)—Inner post-ventral edge of mantle differentiated with papillae and flaps; glochidia normal in shape, medium in size.

Genus XXVII. CARUNCULINA (Simpson)

64. *C. parva* (Barnes)—(1. b)65. *C. texensis* (Lea)—(1. a)66. *C. glans* (Lea)—(1. a)

Genus XXVIII. EURYNIA (Raf.)

Sub-Genus (II). MICROMYA (Agassiz)

67. *E. (Micromya) limosa* (Conrad)—(3. c)68. *E. (Micromya) iris* (Lea)—(3. c)69. *E. (Micromya) brevicula* (Call)—(3. c)(18). *E. (Micromya) brevicula Brittsii* (Simpson)—(1. c)Sub-Genus (III). EURYNIA (*sens. strict.*)70. *E. (Euryنيا) subrostrata* (Say)—(1. a)71. *E. (Euryنيا) recta* (Lamarck)—(1. c)

Genus XXIX. LAMPSILIS (Raf.)

72. *L. anodontoides* (Lea)—(1. a)
 73. *L. fallaciosa* (Smith)—(1. a)
 74. *L. Higginsii* (Lea)—(1. b)
 75. *L. Powellii* (Lea)—(3. c)
 76. *L. luteola* (Lamarck)—(3. c)
 (19). *L. luteola rosacea* (DeKay)—(3. c)
 77. *L. reeviana* (Lea)—(3. c)
 78. *L. ventricosa* (Barnes)—(3. c)
 (20). *L. ventricosa satura* (Lea)—(3. c)

Genus XXX. TRUNCILLA (Raf.)

79. *T. Curtisi* Frierson and Utterback—(3. c)
 80. *T. Lefevrei* Utterback—(3. c)

ENUMERATION OF MISSOURI NAIADES.

FAMILIES.....	2
SUB-FAMILIES.....	3
GENERA.....	30
SUB-GENERA.....	3
SPECIES.....	80
Sub-SPECIES.....	20
TOTAL OF SPECIES AND SUB-SPECIES.....	100

Explanation of Figures.—For the purpose of illustrating the characteristic structures of the animal a few text-figures have been inserted immediately under the different Sub-Families. All figures illustrating these characters are about life-size and, while they are drawn from actual specimens in gravid condition, yet the sketches are more or less diagrammatic in order to emphasize the essential features. The sketches of the glochidia (most of them *figured here for the first time*) are actual camera-lucida drawings by using lenses to magnify 87 diameters. In both sets of these inserted figures, as well as in some of the plates at the close of the text, the following meanings are given to the letters for the labels:—

A=anal opening;	I=inner gill;
AN=anterior end;	M=marsupium;
AV=antero-ventral margin;	P=palp;
B=branchial opening;	PO=posterior end;
D=dorsal, or hinge line;	S=supra-anal opening;
F=foot;	V=ventral margin.

Explanation of Terms, Abbreviations, etc., used in the text, bibliography and check list.—A few technical terms introduced

here are suggested for general use. Reference to the four sections of the shell or mantle edges, limited by the anterior, posterior, dorsal and ventral extremities, can be expressed adjectively and adverbially by the respective terms, "*antero-ventral*," "*antero-ventrad*," "*post-dorsad*," etc. (See Plates I—III). "*Spadiform*" (shape of a spade head) and "*celtiform*" (shape of a celt, or axe-head) are used as adjectives in describing glochidia. In a few shell measurements adoption has been made of Scammon's term, "*umboidal ratio*," (um ra.) which is secured by dropping a line perpendicularly from the tips of the beaks to the longitudinal axis and expressing the distance from the intersection of the two lines to the anterior margin of the shell as a decimal fraction of the entire length of the longitudinal axis. The term, "*inter-dentum*," is used here for the bridge between the lateral and cardinal teeth. The terms, "*bradytic*" and "*tachytic*," as suggested by Ortmann, are adopted as meaning respectively, "long period" and "short period" breeders. The term "*diaphragm*," is also used here for the partition between the branchial and anal openings formed by the gills.

All shell measurements are reckoned in terms of millimeters (mm.) and length, height and diameter are considered consecutively. "*Diameter*" is the distance between the greatest convexities of closed valves. All other usages employed in this work have been in such common adoption as to need no explanation.

To make plain those parts of this catalogue,—especially the Synonymy and Bibliography,—the equalities for the abbreviations are given as follows:—

- Am. J. Conch.—American Journal of Conchology.
- Am. Jl. Sci. and Arts.—American Journal of Science and Arts.
- Am. Nat.—American Naturalist.
- An. Car. Mus.—Annals of the Carnegie Museum.
- Biol. Bull.—Biological Bulletin.
- Bull. Wash. Coll.—Bulletin of Washburn College.
- Bull. U. S. Mus.—Bulletin of the United States Museum.
- Bull. U. S. B. F.—Bulletin of the United States Bureau of Fisheries.
- Jl. (or Jour.) Ac. N. Sci. Phila.—Journal of the Academy of Natural Science of Philadelphia.
- J. Cinn. N. Hist. Soc.—Journal of the Cincinnati Historical Society.
- Jl. Phila. A. Sci.—Journal of the Philosophical Academy of Science.
- Mal. Soc. Lon.—Malacological Society of London.
- Moll. Chicago, Pt. I.—Mollusks of Chicago, Part I.
- Monog. Biv. Ohio.—Monograph of the Bivalves of Ohio.

Naut.—Nautilus.

N. Harm. Diss.—New Harmony Disseminator.

Pr. (or Proc.) Ac. N. Sci. Phil.—Proceedings of the Academy of Natural Science, Philadelphia.

Pr. Am. Phil. Soc.—Proceedings of the American Philosophical Society.

Pr. Mich. Ac. Sci.—Proceedings of the Michigan Academy of Science.

Pr. Ohio Ac. Sci.—Proceedings of the Ohio Academy of Science.

Pr. U. S. Nat. Mus.—Proceedings of the United States National Museum.

Tr. (or Trans.) Ac. Sci. St. Louis.—Transactions of the Academy of Science of St. Louis.

Tr. Am. Fish. Soc.—Transactions of the American Fish Society.

Tr. Am. Phil. Soc.—Transactions of the American Philosophical Society.

U. S. B. F. Ec. Cir.—United States Bureau of Fisheries, Economic Circular.

U. S. B. F. Doc.—United States Bureau of Fisheries Document.

(To be continued.)

NOTES ON OUR LOCAL PLANTS.—XI.

BY J. A. NIEUWLAND.

Lake Maxinkuckee (Clarke).

BRASSICA Cicero, Cato, Pliny XIX:8, XX:9.

Brassica Linn., Syst., (1735), Gen., 197 (1737), 299 (1754), Tour., Els., 188 (1694), I. R. H., 219 (1700) also V. Cordus, Brunfels, Lobelius, Tragus, Eric. Cordus, Matt., Lonicer, Gesner Tabernaemontanus, Castor Durante, Dodonaeus, Fuchs, Turner, etc., etc.

Brassica Napus Linn., Sp. Pl., (1753).

Napus sylvestris Bauhin, Pinax, 95 (1623), *Napus sativa* C. Bauhin, l. c.

Lake Maxinkuckee, (Clarke). Found escaped from cultivation, as also is *Brassica Rapa* and *Brassica oleracea*.

CAKILE Serapion, Semp., c. 65 (1531). Also *Cakile* Cusa, Camerarius, *Cakile* Linn., Syst., (1735), Gen., 196 (1737) 300 (1754), Tour., Els., (1694), I. w. H., 212 (1700), *Cakile* Miller, Gard. Dict., Abr., Ed. 4 (1754).

Cakile edentula (Bigel.) Hook., Fl. Bor. Am. I. 59 (1830).

Bunias edentula Bigelow, Fl. Bort., 157 (1814).

Millers (Umbach), Lake Co. (Deam). Laporte Co., (Deam) 211, 9062 Millers. Common only in the dune region of Lake Michigan near the shore line.

DENTARIA Lobelius, Obs., 391 (1576).

Dentaria Tour., Els., 192 (1694), I. R. H., (214 1700), *Dentaria* Linn., Syst. (1735), Gen. 196 (1737) 295 (1754), *Dentaria* Clusius, C. Bauhin, Pinax, 322 (1623), Gerard, Tabernaemontanus, Camerarius, Caesalpinus, etc. *Dentellaria* Dalechamps, Cusa.

Dentaria lacinata Muhl., Willd. Sp. Pl., III, 479 (1800).

Cardamine laciniata Wood, Bot. and Florist, 38 (1870).

Lake Maxinkuckee (Clarke), St Joseph Co. (Rothert), Laporte Co. (Deam). 3590, 11081½ Notre Dame (Powers) 452 South Bend, Ind., 11081 Notre Dame. Common throughout the region. It varies considerably in leaf shape. Some specimens have almost entire leaves, others broadly parted, and others further dissected and laciniate.

SINAPIS Dioscorides 2:154, Theophrastus 7:3 and 6 Pliny XIX:68, XX:22.

Sinapis Linn., Syst., (1735) Gen., 197 (1737), 299 (1754), Tour., Els., 193 (1694), I. R. H., 277 (1770), *Sinapis* Brunfels, Fuchs, Turner, Castor Durante, Matthioli, Lacuna, Caesalpinus, Dodonaeus, and of all the older authors.

Sinapis alba Linn., Sp. Pl., 668 (1753).

Brassica alba (Linn.) Boiss.

2501, Notre Dame, (Powers), 9325, 9306 Notre Dame.

Sinapis arvensis Linn., Sp. Pl., 668 (1753).

Notre Dame, Ind.

Family 77. **CAPPARIDEAE** Vent., Tabl. III,

118 (1794).

Capparidaceae Lindley, Nat. Syst., ed. 2, 61 (1836).

JACKSONIA Raf., Med. Rep., V, 352 (1838).

Polanisia Raf., Am. Month. Mag. 267 (1818) also Jr. Phys., 89, 98 (1819).

Jacksonia trifoliata Raf. l. c.

Polanisia graveolens Raf., Jr. Phys. l. c., *Polanisia dodecandra* B. S. P. Cat. N. Y. 6 (1888); *Cleome dodecandra* Michx., Fl. Bor. Am., 2, 32 (1803) not *Cleome dodecandra* Linn.

South Haven, Berrien Co., Mich. (L. H. Bailey), 11524 Notre Dame, Ind. 9750 Dune Park, Lake Co. Common in sandy banks of the St. Joseph River and in the Dune region as also along the railroads.

Family 78. **SARRACENIACEAE** Dumort. Anal.

Fam. Pl., 53 (1829).

Also Engler and Prantl Pflnzfam. Nachtr. 348 (1897).

BUCANEPHYLLUM Plukenett, Alm. 71 (1696).

Also Almath. 46, t. 376, f. 6 (1705); Phytog. 3, t. 152, f. 3 (1692), *Coilophyllum* Morison Hist. 3, 523 (1699), *Sarracena* Tour. I. R. H., App. 657, pl. 476 (1700), also Linn., Syst. (1735). Index of Sp. Pl. (1753). Gen. 149 (1737), 224 (1742), 226 (1754), *Sarracenia* Sp. Pl. 510 (1753).

Bucanephyllum americanum Pluk. Almag (1696) and Almath. l. c. (1705).

Sarracenia purpurea Linn., Sp. Pl. l. c. *Sarracena canadensis* Tour. l. c. *Bucanephyllum purpureum* (Linn.).

Laporte Co. (Barnes), Lake Co. (Hill), Clarke, Ind. (Umbach) Casella, Ind. (Higdon and Raddin), Lake Maxinkuckee (H. W. Clarke), 2787 Mineral Springs (Porter Co.) 9650 Chain Lakes, St. Joseph Co., 2672 Sagunay, Laporte Co. Found also in a tamarack swamp along the Turkey Creek road S. E. of South Bend, Ind. in Cass Co., Mich. near Bankson Lake, also W. of the same lake in great abundance growing with *Isotria verticillata* (Willd.) Raf. *Pseudorchis Loeselii* (Linn.) S. F. Gray. [*Leptorchis Loeselii* (Linn.) Dum.] N. and *Calopogon pulchellus* R. Br. or *Cathea tuberosa* (Linn.) Mac M.

Family 79. **DROSERACEAE** DC., Theor. Fl. 214

Prod. I, 317 (1724).

RORELLA Valerius Cordus, Hist., 86 (1561).

Also *Salsirora* l. c. *Thalius*, Hanc. 116 (1588). *Rorida* Lobelius, Icon. 81 (1581) also Adv. and Obs. 472 and 354 (1576) *Rorella* Allioni, Fl. Pedem. II, 88 (1785) Haller, Fl. Helv., 371 (1768), Ruppius Jen. 90 (1726), 114 (1745), *Thalius* l. c. *Lobellius* l. c. *Rosolis* Adans., Fam. Pl. II, 245 (1763), *Ros solis* and *Ros Solis* Els. 211 (1694), I. R. H. 245 (1700), C. Bauhin, Pinax, 356 (1623) and of many pre-Linnaean authors, e. g. Dodonaeus, Lonicer. Castor Durante, Camerarius, Hort. Med. 742 (1588). *Drosion* Lobelius, Obs. Syn. l. c. *Solaria* Camerarius l. c. syn. *Drosera* Linn., Syst. (1735), Gen. 89 (1737) 136 (174).

Rorella Cordi Lobelius, Obs. 472, et in indice (1576).*Rorella vulgaris* Ruppius l. c. *Ros solis major* Gerārd, *Drosera*

rotundifolia Linn., Sp. Pl. 281 (1753), *Rorella rotundifolia* (Linn.) Allioni, l. c.

Casella, Ind. (Higdon and Raddin), Lake Co., (S. Coulter), Lake Maxinkuckee (H. W. Clarke), 223, 9460. Cass Co., Mich., Clarke, Ind. (Umbach).

***Rorella intermedia* (Hayne).**

Drosera intermedia Hayne in Schrad. Jr. Bot. 1, 37 (1800), *Drosera americana* Willd., Enum 340 (1809).

Lake Co. (S. Coulter), Millers, (Bastin), 10246 Mineral Springs, Porter Co. In a bog of the dune region at the edge of a pond which usually dries up completely in summer. During the very dry weather of Aug. 1913 the peat caught fire and the whole region was devastated. All vestiges of the plant were destroyed and it has not reappeared. Found in close proximity of *Scleria verticillata* and *Polygala cruciata* which also are now gone.

Order 28. CALOPHYTAE.

Bartling, Ord. Nat. Pl. 330, 398 (1830).

Rosales Lindley. Nix. Pl. 21 (1833). Bentham and Hooker, Gen. 1, 13 (1865), Engler and Prantl., Pflanzfam. Nachtr. 348 (1897).

Family 80. **CRASSULACEAE** DC., Bull. Plilom.
49 (1891).

Also Lam. DC., Fl. Fr. 3, 4, 382 (1805), Bartling, l. c. 224 and 309 (1830).

SEDUM Pliny, Hist. 26 : 8, also Columella.

Sedum, *Cepaea* or *Telephium* of nearly all the pre-Linnaean writers, See C. Bauhin, Pinax 284, 287, 288 (1623), *Anacampseros* Gesner, *Sedum* Tour. Els. 229 (1694), I. R. H. 262 (1700), *Sedum* Linn. Syst., (1735), Gen. 136 (1754).

Sedum triphyllum (Haw.) S. F. Gray. Nat. Arr. Br. Pl. II, 540 (1821).

Anacampseros triphylla Haw., Syn. Pl. Succ. 111 (1812).

Lake Maxinkuckee (Clarke). Found at Notre Dame, Lakeville, N. Liberty, Mishawaka, Benton Harbor, and St. Joseph. Common and spreading in woods near farm houses.

Sedum minimum Tabernaemontanus, (1580) Lobelius Adv. (1576).

Aizoon acre Cordus Hist. 98 (1561), *Sedum acre* Linn. Pan Suecus, Amoen. II, 248 (1751). Sp. Pl. 432 (1753).

Escaped from gardens and graveyards. Notre Dame, Ind., St. Joseph, Mich., Mishawaka, Ind.

Family 81. **PENTHORACEAE** Rydberg. N. Am.

Fl. 22, 75 (1905).

PENTHORUM Gronovius, Fl. Virg.; 51 (1739).

Penthorum Linn., Gen., 204 (1742), 197 (1754). Linn. Act Upsla. 12. t. 2 (1744).

Penthorum sedoides Linn., Sp. Pl., 432 (1753).

Lake Maxinkuckee (Clarke), Clarke, Ind. (Umbach), Lake Co. (Deam), Pine, Ind. (Umbach, Steele), Bascom, (W. Hahn), Notre Dame, 9380.

Family 82. **PARNASSIEAE** S. F. Gray, Nat. Arr

Br. Pl. II, 623 (1821).

Parnassiaceae Dumort., Anal. Fam. 37, 42 (1829).

PARNASSIA Tour. Els. 212 (1694), I. R. H. 246 (1700).

Parnassia Linn., Syst., (1735), Gen. 87 (1737); 133 (1754); also Haller, Helv. 316 (1742) *Enneadynamis* Gesner, Hort. Germ., 261 (1561) in syn. Six-syllabled word!

Parnassia caroliniana Michx., Fl. Bor. Am. I, 184 (1803).

Lake Co. (Deam, Hill), Lake Maxinkuckee (Clarke), 2112 Chain Lakes, 11623 Notre Dame, 3987 Notre Dame (Powers).

Family 83. **SAXIFRAGEAE** Vent., Tab. III, 277 (1799).

Saxifragaceae DC., Lam. and DC. Fl. Fr. 3, IV, 358 (1805) also Prod. IV, 1 (1830). Endlicher, Gen. 813 (1839).

MICRANTHES Haw. Syn. Pl. Succ. 320 (1812).

Saxifraga of authors in part.

Micranthes pennsylvanica (Linn.) Haw., Saxifr. Enum.

Saxifraga pennsylvanica Linn., Sp. Pl., 399 (1753), also Dillenius, Hort. Eltham. 337 (1732).

Clarke, Ind. (Umbach), Lake Maxinkuckee (Clarke), St. Joseph Co. (Rothert), Lake Co. (Hill), 1880, 9461, 1886 420 Notre Dame, 9197 Granger, St. Joseph Co., Ind., 830 N. Liberty, Ind. Common in all the counties in moist ground.

HEUCHERA Linn., Syst. (1735), Gen. 68 (1737), 106 (1754). Hort Cliff. 82 (1737).

Heuchera americana Linn., Sp. Pl., 226 (1753).

Turkey River (Clarke).

Heuchera hispida Pursh, Fl. Am. Sept., 188 (1814).

Lake Maxinkuckee (Clarke), Lake Co. (Hill).

Heuchera hirsuticaulis (Wheelock) Rydberg Britt. Man. 482 (1901).

Heuchera hispida hirsuticaulis Wheelock, Bull. Torr. Cl., 17, 199 (1890).

Marshall Co. (Deam), 10528 Notre Dame, 9681, 9440 Chain Lakes, 43 Granger, Ind.

TIARELLA Gen. 190 (1754).

Tiarella cordifolia Sp. Pl. 405 (1753).

St. Joseph Co. (Rothert.)!

I have nowhere found it within the region.

MITELLA Tour., Els. 207 (1694) I. R. H. 241 (1700),

Mitella Linn., Syst., (1735), Gen. 131 (1737), 190 (1754).

Mitella americana Tour., Els. 207 (1694).

Mitella diphylla Linn., Sp. Pl. 406 (1753).

Grand Haven, (Umbach), St. Joseph Co. (Rothert), Notre Dame, 4008, 2036, 4009 (Powers), Notre Dame, 1891, 10008, 406, 815, 2527, 2534.

CHRYSOSPLENIUM (Tabernaemontanus). Tour. Els., 122 (1694), I. R. H. 146 (1700).

Also Linn., Syst. (1735), Hort. Cliff. 149 (1737), Gen. 115 (1737), 189 (1754).

Chrysosplenium americanum Schwein. in Hook. Fl. Bor. Am. I. 242 (1832).

Chrysosplenium oppositifolium Walt., Fl. Car. 140 (1788) not Linn.

Lake Maxinkuckee (Clarke), Porter Co. (Deam), 810, 10012 Notre Dame.

Family 84. **HYDRANGEACEAE** Dumort., Anal.

Fam. 36, 38 (1829).

PHILADELPHUS Athenæus, Dipnosophistae, XV:29, probably.

Philadelphus C. Bauhin, Pinax, 398 (1623). *Syringa* Tour. Els. 491 (1694), I. R. H. 617 (1700), *Philadelphus* Linn. Syst. (1735), Gen. 140 (1737), 211 (1754), *Syringa* of a great many of the pre-Linnaean authors, the name used also for the Lilac.

Philadelphus coronarius Linn., Sp. Pl. 470 (1753).

Escaped around Notre Dame by seed and maintaining itself well under very unfavorable conditions.

Family 85. **HAMAMELIDACEAE** Lindley, Veg.
Kingd. 784 (1847).

Hammaelideae Abel. Nar. Jour. China. App. B. 374 (1818),
DC. Prod. IV. 267 (1830).

TRILOPUS Mitchell, Act. Acad. Leop. Carol. VIII, App.
211 (1748) also (1769).

Hamamelis Linn., Gen. 254 (1742), 559 (1754) not *Hamamelis*
of the older authors which was a pomaceous plant, (*Mespilus* Sp.)

Trilopus virginiana (Linn.) Raf., New. Fl. N. Am. III, 17
(1836). cor.

Hamamelis virginiana Linn. Sp. Pl., 124 (1753).

Laporte Co. (Deam), Lake Co. (Deam), Porter Co. (Deam),
Clarke, Ind. (Umbach), Marshall Co. (Deam), Lapaz Junction,
Marshall Co., 11119, Millers, Ind., 2648, Mineral Springs, Porter
Co., 10211, 11540, 11031, 11034, 10211, St. Joseph, Mich., 470,
Michigan City, Laporte Co., 9262, Notre Dame, 9343, 10439,
11738, 11737, 10439, 11125.

Trilopus virginiana var. *angustifolia* Nwd.

Hamamelis virginiana var. *angustifolia* Nwd. Am. Nwd. Nat.
III, 63 (1913).

Hudson Lake, Laporte Co., 10431.

Trilopus virginiana var. *orbiculata* Nwd.

Hamamelis virginiana var. *orbiculata* Nwd. Am. Mid. Nat.
I. c. p. 64.

Tamarack, Porter Co. Ind. 719, Mineral Springs, 11641.

Family 86. **GROSSULARIACEAE** Dumort. Anal.
Fam. Pl. 37 (1829).

GROSSULARIA Ruellius, Hist. Stirp. 213 (1543).

Also Tour. Els. 501 (1694), I. R. H., 639 (1700), Miller, Gard.
Dict. Abr. (1754), Clusius, Hist. (1605). *Rocella* Cardanus.

Grossularia Cynosbati (Linn.) Miller. Gard. Dict. Ed. 8, (1768)

Ribes Cynosbati Linn., Sp. Pl. 202 (1753).

Millers (Umbach), Lake Maxinkuckee (Clarke), Lakeville
9260, Benton Harbor, 11012, Notre Dame, 1970 (Powers),.

Grossularia missouriensis (Nutt.) Cov. and Britton, N. Am. Fl. 22, 221 (1908).

Ribes gracile Pursh, Fl. Am. Sept. 165 (1814). *Ribes missouriense* Nutt., T. and G., Fl. N. A. 1, 548 (1840).

Notre Dame (Johnson) [Calumet, S. Chicago (A. Chase)].

RIBES Fuchs, 1542 also Ruellius, Nat. Stirp, 213 (1543).

Ribesium Dodonaeus, Pempt, 749 (1583), Dill., Hort. Elth., 324, 246 (1732), *Ribes* Lobelius, Clusius, Besler, *Ribes* Linn., Gen. 68 (1737), 94 (1754). Included in *Grossularia* by Tournefort.

Riles vulgare Lamarck, Encycl. 3, 47 (1789).

Escaped in places.

COREOSMA Spach, Veg. Syst. VI, 154 (1838) also Ann. Nat., Ser. II, IV, 2 (1835).

Coreosma and *Calobotrya* Spach, Veg. Syst. 1. c.

Coreosma americana (Miller).

Coreosma florida Spach. Veg. Syst. 1. c. 157. *Ribes floridum* L'Herit., Stirp. Nov. 1, 4 (1784). *Ribes americanum* Miller, Gard. Dict., ed. 8, (1768).

Lake Maxinkuckee (Clarke), Lake Co. (Blatchley), 1969 Notre Dame (Powers), 1910, 2539, 11010 Notre Dame, 825 North Liberty, 11121 Lapaz Junction.

Coreosma americana var. **mesochora**.

Differt a praecedente floribus pubescentioribus (an semper?) angustioribus longioribus, foliis plus incisiss serratis majoribus, racemis diffusioribus longioribus, *Scpalorum partibus linearibus acutiusculis, tubo longioribus*, petalis quoque multo longioribus, angustioribus.

This variety found in the dune region in the edge of a tamarack arbor vitae bog, is characterized by very narrow acutish sepal lobes rather long and very narrow, linear to linear oblanceolate acute or obtusish. The leaves are deeper and more sharply cut and serrate, and larger. The racemes long and with widely scattered flowers. The plant has long straggling branches, and generally of more slender habit. The twigs are grayish white and it blooms about half a month or more later.

Found at Mineral Springs, Porter Co., Ind., May 29, 1913. No. 11061 Notre Dame University Herbarium.

Coreosma odorata (Wendl.)

Chrysobotrya revoluta Spach. An. Sc. Nat. 2 ser. IV. t. 1 A. (1835) also Hist. Nat. Veg. VI. 149 (1838), *Ribes odoratum* Wendl.,

Bartl. and Wendl. Beitr. 2, 15 (1825), *Ribes aureum* Pursh, Fl. Am. Sept. 164 (1814).

Persisting as an escape, Notre Dame, Ind., also at Webster's Crossing.

Family 87. **PLATANACEAE** Lindley, Nat. Syst.,
ed. 2, 178 (1836).

PLATANUS Theophrastus, III : 7.

Also Pliny, X: 44, XXIV: 8, Dioscorides I: 107, Varro, I: 7, Claudius, Hymen, Palladius, de Ins. 87, *Platanistos* Homer, Iliad B: 310, Theoc. XVIII: 44, *Platanus* Tour., Els. 463, I. R. H. 590 Linn., Syst., (1735), Gen. 358 (1737), 433 (1754) and of all the older authors before Linnaeus.

Platanus occidentalis Catesby, Ornith.

Platanus occidentalis Linn., Sp. Pl., 999 (1753), *Platanus occidentalis aut virginensis* Park. Theatr. 1427 (1690).

Lake Maxinkuckee (Clarke), 2042 Notre Dame (Powers).

Family 88. **SPIRAEACEAE** Loiseleur-Delong-
champs, Man. Pl. Indig. 1, 188 (1818).

Also Nouv. Voy. dans L'Empire Flor. 284 (1817) as subfamily, also Bartling, Ord. Nat. Pl. 230, 403 (1830), Spach, Hist. Nat. Veg. I, 427 (1834).

ULMARIA Clusius, Pann., 699, 700 (1583).

Also Gesner, Camerarius, Tabernaemontanus, etc. *Medesiusium* Cordus, Hist. (1561) (?) *Ulmaria* Tour., Els., 231 (1694), I. R. H. 265 (1700), Stricto sensu. *Spiraea* Sp. Linn., Under *Spiraea* Linn., Gen. 216 (1754), Sp. Pl., 489 (1753), inclusive of *Filipendula*, and *Ajuncus*. *Filipendula* Syst., (1735), and Gen. 145 (1737), Hort. Cliff. 191 (1737) inclusive of *Ulmaria*.

Ulmaria rubra Hill, Hort. Kew. 214, pl. 7, (1769).

Spiraea lobata Gronov. Jacq. Hort. Vind. 138, pl. 88 (1770), *Spiraea rubra* Britton, Bull. Torr. Bot. Cl. 18, 270 (1891). *Filipendula rubra* Robinson, Rhodora, 8, 204 (1906).

10483 Bertrand, Mich., Berrien Co., (B. Gregory.)

SPIRAEA Theophrastus, I: 23.

Spiraea Tour., Els 490 (1694) I. m. H., 613 (1700) also C. Bauhin, Pinax, 475 (1623), *Spiraea* Clusius Hist., I, 80 (1605).

Spiraea alba Duroi, Harb. Baumz. II, 430 (1772).

Spiraea salicifolia lanceolata T. and H., Fl. N. Am., I, 145 (1840).

Notre Dame, 9377, 1897, 11460.

Spiraea latifolia (ait.) Borek. Handb. Forstbot. 1871 (1803).

Spiraea salicifolia latifolia Ait., Hort. Kew. 2, 198 (1789).
9085 Notre Dame, 9756, Dune Park.

(Plants reported as *S. salicifolia* from Lake Maxinkuckee (Clarke). Porter Co. (Deam), Laporte Co. Deam). I have been unable to verify as to which of the above they may be.)

Spiraea tomentosa Linn., Sp. Pl., 489 (1753).

Lake Maxinkuckee (Clarke), Millers (Umbach), Laporte and Porter Cos. (Deam), Dune Park (A. Chase), Notre Dame 1899, 3319.

OPULASTER Medic., Pfl. Anat. 2, 109 (1799).

Physocarpa Raf., N. Fl. N. Am. 3, 73 (1836), *Physocarpus* Maxim., Act. Hort., Petrop., 6, 219 (1879).

Opulaster opulifolius (Linn.) Kuntze, Rev. Gen. Pl. 949 (1891).

Spiraea opulifolia Linn., 489 (1753), *Neillia opulifolia* Brewer and Watson, Bot. Calif., 1, 171 (1876).

Lake Maxinkuckee (Clarke), Lake Co. (Umbach), Notre Dame 7815, 1919 (Powers) Notre Dame 566, 568, 499, 2449, St. Joseph, Mich. 33 Stephenville, Berrien Co., Mich. 2723.

Family 89. **DRYADEAE** Vent., Tabl., III, 346.

Also Bartling, Ord. Nat. Pl. 230 (1830), *Fragariaceae* Rich Nestl. Potent. 14, *Comosae* Linn., Phil. Bot. 31 (1751)!

PENTAPHYLLUM Dioscorides, 4:42, Theophrastus, Hist. 9:14.

Pentaphyllum Brunfels, Herb. Viv. Ic., II, 231 (1532), 1, 32 (1531), Ruellius, Diosc. Nat. Med. 4:34 321 (1547).

Quinquefolium Pliny, 25:9, *Quinquefolium* and *Pentaphyllum* Ruellius, Nat. Stirp. 598 (1542) see also Theodore Gaza, ed. Theoph. 134 (1528), Marcellus Vergilius ed. Diosc. 485 (1529), *Pentaphyllum* Heister, Syst. Pl. 7 (1748). Hill, Br. Herball 3 (1756), Gaertner, Fruct. 1, 349 (1788), *Quinquefolium* Morandi, Hist. Bot. Pract., 9 (1761), *Quinquefolium* Robbe in De Chaulnes, Cat. de Pl. Usuelles (1754)! also Adanson 2, 294, 295 (1763).

Pentaphyllum rectum (Linn.).

Potentilla recta Linn., Sp. Pl., 497 (1753), *Potentilla sulphurea* Lam., Fl. Franc. III, 144 (1778).

Millers (Umbach), 2735, 11314, Oliver's, West of South Bend, Ind.

Pentaphyllum argenteum (Linn.).

Potentilla argentea Linn., Sp. Pl., 497 (1753).

St. Joseph Co. (A. Woolman, Barnes), Laporte Co. (Deam), Notre Dame (Powers) 2024, Bertrand, (Augustine), 9336.

The type of the Linnaean aggregate "genus" *Potentilla* is without question *Potentilla Anserina* Linn., although Dr. Britton says it is *Potentilla reptans* Linn. The latter is without doubt the oldest known potentillaceous plant of the pre-Linnaean genera *Quinquefolium* or *Pentaphyllum* but Linnaeus by the very fact that he rejected these names for his aggregate, intimated that in selecting the name therefore he selected also the type of the group from which he took the name for his nondescript genus. Now the plant which before Linnaeus was known as the *Potentilla* of pre-Linnaeans is *Potentilla Anserina* Linn. The name was so first applied by Brunfels. Now it may be argued that by making 1753 the beginning of our nomenclature we need not accept "historical" types of genera. Now *P. Anserina* Linn. is not the oldest plant of the aggregate genus to which Linnaeus gave the name *Potentilla* as already stated, therefore not what we would call the historical type of the "group." We believe, however, that when Linnaeus took the name for the group he sufficiently intimated *ipso facto* and apart from historical reasons, that when segregations were subsequently to be made the name was to be retained for the plant that previously had it. If Dr. Britton and the followers of the theory of residues argue that *Potentilla reptans* Linn. is the type historically and that the historical type should always be selected, then why is not *Panicum talicum* selected as type of *Panicum* or *Milium* instead of putting it in a segregate and applying the name *Panicum* to a group of plants which the originator of the name never knew? Why is *Nymphaea alba* Linn. the undoubted historical type of the genus *Nymphaea* segregated and the original name given to the other plant or plants of the genus? In fact as far as one can see no system whatever is followed in the decision of the manner of determination which plants are the Linnaean "types." All this illogical practical procedure of segregation of Linnaean genera and type selection seems to have as its object the avoidance of confusion. We wonder if they can possibly think they can hope to "avoid confusion" by applying methods as above outlined.

We need not discuss why Linnaeus disregarded the centuries-

old names *Quinquefolium* or *Pentaphyllum*. We can not be presumed to give reasons for the arbitrary method of Linnaeus in this case nor in hundreds of other cases, any more than we wish to presume to explain the arbitrary methods of selections of his types, by his modern followers. It can not be done logically, but we believe that he is to be presumed to want to have the name of a genus left to the group or plant that had it before. Dr. Rydberg² dismisses the whole pre-Linnaean history of the group because the plants were in "such a chaotic condition that it would be impossible to write a history of any value." This is a very expedite way of settling a problem, but it will never help settle confusion in the long run. As long as we resort to methods of expediency in clearing up problems, rather than by applying logical principles we are making confusion worse confounded.

On a number of occasions we have quoted Linnaeus himself writing both before and after 1753 as to his idea of method to be followed in segregating his genera. In the *Philosophia Botanica* p. 197 of both editions, 1751 and 1755, he says: "*Si genus receptum secundum jus naturae, and artis in plurima dirimi debet, tum nomen antea commune manebit vulgatissimae et officinali plantae.*" In the *Hortus Cliffortianus* his most careful work *Potentilla Anserina* is the first plant mentioned. Only a one-named designation is given in the *Species Plantarum* as synonym thus intimating that it was the *Potentilla* par excellence in his opinion, as it was deemed fit to give the name to the group. Of course we are not even supposed according to the theory of residues and the peculiar methods of interpretation of priority to allow Linnaeus to correct his own mistakes or determine his own types when as seldom he does not seem at least to intimate an opinion in the matter.

There is, however, still another point to make and that is that in assigning the theory of residues to effect segregation, the author of the illustrated flora is not consistent.

The segregated genus *Argentina* is attributed to Lamarek (1778). *Pentaphyllum* and *Quinquefolium* were separated from the Linnaean *Potentilla* with *Pentaphyllum* (or *Quinquefolium*) *reptans* [*Potentilla reptans* Linn.] by numerous authors before 1778. If the author feels that it is necessary to accept *Argentina* because segregated first leaving the other plant in possession of the name

² Mem. Dept. Bot. Columbia Univ. Vol. II. p. 2. Monograph N. Am. Potentill. (1898.)

Potentilla by virtue of the theory of residues, then we may say that *Pentaphyllum* was separated as validly as soon, if not sooner, leaving *Potentilla Anserina* as the type even if we apply the very theory of residues to which appeal may be made to excuse the procedure referred to. *Pentaphyllum* was separated from the Linnaean *Potentilla* by Ludwig-Boehmer (1760), special reference being made to *Potentilla reptans* in its specific name. ("*Potentilla joliis digitatis caule repente pedunculis unifloris*, Linn. Sp. Pl. p. 499 N. 17"). In fact segregation of *Pentaphyllum* were made as early as 1754! Possibly the segregations may be looked upon as "hyponyms" perhaps because not published in connection with a binary name? Hill segregated the plant under the name *Pentaphyllum vulgare* in 1756, twenty-two years before Lamarck's date of *Argentina*.

That it is very hard to find just by what principle of nomenclature as to residues, types, priority and the like, the Illustrated Flora (1913 ed) was written we may select the following examples. *Bildedickia* Dum (1827) certainly antedates *Timiana* Webb. and Moq. (1836-40). The author we feel confident knows that the name *Pentaphylloides* is older than *Dasiphora*. It would scarcely do for the author to say that he rejects names ending in *oides* for he has such not a few. *Bildedickia* is not a very beautiful name, but there are others in the Flora that are worse in more ways than one. *Thelypteris* is an older name than *Dryopteris*, but why not acceptable to the Illustrated Flora is a problem we can not hope to solve. Perhaps, *Thelypteris* was not published in connection with a binary name. Nor for that matter were Linnaeus' own genera *Erythronium* *Hydrocharis* etc. as elsewhere pointed out.

That the author does not put much stock in the theory of residues would appear from the fact that the common Dandelion is kept under *Leontodon* contrary to all the precedent of a century or more, and in spite of the fact that *Taxaxacum* was first segregated from the Linnaean aggregate. An exactly parallel procedure would result in the acceptance of *Nymphaea alba* Linn. for type of *Nymphaea* and the reduction of *Castalia* to synonymy although older than *Nuphar*. This would be the logical thing to do by every principle of analogy and reasoning.

Historically there can be no question that the white water lilies are typical of the genus. Even Dioscorides himself brings

this out. Following is the translation of his text made by Ruellius as early as 1547.³

"*Nymphaea nascitur in paludibus and stagnantibus aquis foliis fabae Aegyptiae, minoribus albiis in summa aqua alis demersis pluribus ex radice eodem proceduntibus FLORE LILIO ALBO, and in medio crocos habente, cum defloruerit, ut rotundum malum aut papaveris caput extuberat. . . . est et altera nymphaea cujus flos blephara dicitur foliis ante dictae radice albo scabro, FLORE LUTEO nitente rosae simile etc.*

There are other inconsistencies not a few which we can not comprehend. We have tried our best to try to imagine how one can logically explain these matters, but so far are unable to do so. No reasons being given for methods of procedure which may be applied in one case and rejected in a perfectly similar one, one would suspect that the code tinkers reserve for themselves the privilege of keeping or breaking the rules as suits their fancy. "Rex super legem," seems to be the rule when most of the botanical public must take their rules of nomenclature and botany second-hand, diluted, expurgated and altered to the whims and fancies of the manualists.

POTENTILLA Brunfels ex C. Bauhin Pinax, 321 (1623).

Argentina Ray meth. 102 (1682) Dodonaeus Hist, 65 (1557) Lobelius Hist. 395 (1576), Dodonaeus Pempt, 589 (1583) *Argentina* Hill, Br. Herb. 6, (1756) Trew, Herb. Blackw., 119 (1755). *Anserina* Tabernaemontanus Kreutterb. 327 (1625), also *Chenoposcon* and *Hercularis* and *Potentilla* and *Portentilla*, *Anserina* Tragus, *Potentilla* Matthioli, Fuchs Hist. and Stirp, 2 lib, and 212a (1546). Stirp Hist. 355 (1549), Caesalpinus De Plantis 557 (1558), also Lonicer, Castor Durante, Thalius, *Stephanomelidides* Pliny? *Dactylophyllum* Spen., Fl. Frib., 3, 1084.

Potentilla Anserina Linn., Sp. Pl., 495 (1753).

Argentina vulgaris Lam., Fl. Fr., 3, 1778), *Anserina Anserina* Rydb. Mem. Dept. Bot. Col. Un., 2, 159 (1898), and Four. Ann., Soc., Linn., Lyon., (11) 16, 302, 404 (1863), *Dactylophyllum Anserina* Spen. l. c., *Fragaria Anserina* Crantz, Stirp. Austriac., 2, 9, ed. 27, (1771).

St. Joseph Co., (C. D. Mell), Clarke, Ind. (Umbach), Lake

³ Diosc. Anazarb. III. cap. CXXXVI. ed. Ruellius, T. p. 289 (1547). See also Sibthorp J. Prod. Fl. Graec. 360, 362 (1806).

Co. (Hill), Porter Co. (Cowles), 2688) Galien, Mich., 2721 Stephenville, Mich.

DRYMOCALLIS Fourr., l. c. II, 16, 371, (1868).

Boothia Bigelow, Fl. Bost., ed. 2, 206 (1826), not Adanson (1763).

Drymocallis agrimonoides (Pursh) Rydb. N. Am. Fl. 22, 368, (1908).

Drymocallis arguta (Pursh). *Potentilla arguta* Pursh, Fl. Am. Sept. 736 (1814). *Geum agrimonoides* Pursh Fl. Am. Sept., 351 (1814).

Found at Notre Dame and at Galien, Mich.

TRIDOPHYLLUM Necker Els., 2, 93 (1790).

Potentilla Linn. l. c.

Tridophyllum monspeliense (Linn.) Greene, Leaflets, 1, 189 (1906).

Potentilla monspeliensis Linn., Sp. Pl., 499 (1753).

Laporte (Deam), Notre Dame, 10434.

Tridophyllum norvegicum (Linn.) Greene, l. c.

Potentilla norvegica.

Notre Dame 2625 (Powers).

CALLIONIA Greene, Leaflets, 1, 238 (1906).

Named after one of the gardener slaves of Theophrastus, Callion!

Callionia canadensis (Linn.) Greene l. c.

Potentilla canadensis Linn. Sp. Pl., 498 (1753).

Millers (Umbach), Lake Maxinkuckee (Clarke), Laporte Co., (Deam) 3866, 2026 Notre Dame (Powers), 10572 Notre Dame. A common weed throughout the region.

DASIPHORA Rafinesque, Aut. Bot., 167 (1838).

Pentaphylloides Duhamel, Traite des Arbres et Arbutes, 99 (1755), also Morison, Ox., 2, 193 (1715). *Comocarpa* T. and G., Fl. N. Am., 1. 445 (1840) as subgenus under *Potentilla*, *Comocarpa* Rydb., Mem. Col. Un., 2, 19, pl. 101 (1898).

Pentaphylloides rejected for reasons already given.

Dasiphora fruticosa (Linn.) Rydb., Mem. l. c. 188.

Potentilla fruticosa Linn., Sp. Pl., 495 (1753), *Dasiphora riparia* Raf. l. c., *Pentaphylloides fruticosa* Ray, Syn., 3, 2561, *Comocarpa fruticosa* Rydb., l. c. pl. 101.

Lake Co. (Deam, Bradner), Lake Maxinkuckee (Clarke),

Indiana Harbor, (A. Chase), 530, 881, 914, Chain Lake, 758 Sagunay.

PANCOVIA Heister, (1737) ex Adanson, 2, 294 (1763).

Comarum Linn., Sp. Pl., 502 (1753), also Hort. Cliff., 195 (1737). Gen. 148, (1737), 220 (1754). *Comarum* rejected because it is the exact Greek equivalent for *Fragaria*.

Pancovia palustris (Linn.).

Comarum palustre Linn. Pan. Suec. 249 (1751), Sp. Pl., 359 (1753). *Potentilla palustris* Scopoli, Fl. Car. 2, 359 (1772).

Lake Maxinkuckee (Clarke), Clarke, Ind. (Umbach), Lake and St. Joseph Cos. (Blatchley), 545, 885 Chain Lakes, 2624 Millers, Lake Co.

FRAGARIA Cuba, Hort. Sanit., 15th Century.

Also *Fragaria* Brunfels Herb. Viv. Ic., (J. de Manliis) 2, 173 (1531), *Fragula* Cordus, Hist., 173 (1561), *Fragaria* Tour., Els., 245 (1694) I. R. H. 295 (1700) also Tragus, Fuchs, Dodonaeus Gesner, Lonicer, Lobelius, Castor Durante, Gerarde, etc., Linn., Gen., 147 (1737), 218 (1754).

Fragaria vulgaris Tour., Els., 245 (1694), et C. Bauhin Pinax, 326 (1623).

Fragaria vesca Linn., Sp. Pl., 494 (1753), *Fragaria vulgaris* Linn., Pan Suecus, 259 (1751).

Highland Park, (J. Shaddock), 1950 Notre Dame. Found very commonly along railroads from seed probably thrown from trains.

Fragaria grayana Vilmorin; Gay, Ann. Sci. Nat., IV., 8, 202, (1857).

Found in St. Joseph Co.

Fragaria virginiana Duchesne, Hist. Nat. Fras., 204 (1766).

Lake Maxinkuckee (Clarke), Grand Haven (Umbach), Pine (Umbach), 10096, 12430 Mineral Springs.

GEUM Pliny 26:7.

Geum Gesner, Hort. Germ., 260 (1561) also Turner, *Caryophyllata* Tour. Els. 244 (1694), I. H. R., 294 (1700), also Matthioli, Lacuna, Thalius, Castor Durante Tabernamontanus, Camerarius, Clusius, Gerarde, Anguillara C. Bauhin, etc. *Caryophyllata* Brunfels, Tragus, Dodonaeus, Lonicer.

Geum canadense Jacquin, Hort. Vind., 2, 82, pl. 175 (1772).

Geum carolinianum Walt., Fl. Car., 150 (1788), *Geum album* Gmel., Syst., 2, 861 (1791).

Michigan City (C. D. Mell.), Lake Maxinkuckee (Clarke), 44, Granger, 2698 Notre Dame, 2683, 9615 South Bend.

Geum virginianum Linn., Sp. Pl., 500 (1753).

Lake Maxinkuckee (Clarke), Porter (Dean), St. Joseph Co. (Barnes).

Geum strictum Ait., Hort. Kew., 2, 217 (1789.)

1829, 1828 Notre Dame, 869 Grand Beach, Berrien Co.

STYLIPUS Raf., Neog., 3 (1825).

Stylipus vernus Rafinesque, l. c.

Geum vernum T. and G., Fl. N. Am., 1. 422 (1840).

501, 9615, 10112 South Bend, 430, 9139, 2705 Notre Dame.

RUBUS Vergil, Ecl. 3:89, Georg., 3315:

Batos Theophrastus, Hist., 2:16, 3:16, 6:1, Caus., 1:21, Diosc. 4:38, *Rubus* Pliny, 16:37, 24:14, Colum., 3:11, 4:31, 7:6, Apulej. Cels. 7:27, 6:14.

Rubus canadensis Linn., Sp. Pl., 494 (1753).

Lake Maxinkuckee (Clarke), St. Joseph (Rothert), 2061 Notre Dame (Powers).

Rubus allegheniensis Porter, Bull. Torr. Bot. Cl., 23, 153 (1896).

9145, 9134, 11179, 506 South Bend.

Rubus hispidus Linn., Sp. Pl., 493 (1753).

Lake Maxinkuckee (Clarke), Millers (Umbach), 9148 South Bend, 9277 Granger, Ind.

Rubus hispidus forma, **pleniflorus**.

Plant with doubled flowers and stamens nearly all gone. Leaves with leaflets larger and the stalks beset with slender prickles. Flowers intensely sweet smelling pure white like a small doubled rose.

11252 collected near Summit Farm No. 4 west Sample St. about 4 or 5 miles from South Bend, Ind. This might prove a good plant for garden cultivation but has been so far difficult to grow as the plants can hardly be transplanted without dying. It blooms longer than the type and seem to continue most of the summer, and often blooms again late in fall. It grows in dense shade along the road where it was cleared from the neighboring woods.

Rubus procumbens Muhl., Cat., 50 (1813).

Rubus villosus Ait., Hort. Kew., 2, 210 (1789).

Lake Maxinkuckee (Clarke), Miller, Ind. Clarke (Umbach)
9307 Notre Dame.

Rubus baileyanus Britton Mem. Torr. Cl. 5, 189 (1894).

Rubus villosus var. *humifusus* T. and G., Fl. N. Am., 1. 455
(1840) not Weihe, (1825).

Lake Maxinkuckee (Clarke), 1310., 11198 Notre Dame.

Rubus andrewsianus Blanchard, Rhodora, 8, 17 (1906).

1902, 11239 N. Notre Dame, Ind.

Rubus triflorus Richards, Franklin Journ., ed. 2, App., 19
(1823).

Rubus saxatilis var. *canadensis* Michx. Fl. Bor., Am., 1. 298
(1803), not *Rubus canadensis* Linn. (1753), *Rubus saxatilis* var.
americanus Pers., Syn. 2, 52 (1807).

Millers (Umbach), Lake Co. (Hill), 2333 Lawton, Mich.,
11303 W. of South Bend 2784, 10097 Mineral Springs.

BATIDAEA Greene, Leaflets, 1, 238 (1906).

Batidaea strigosa (Michx.) Greene, l. c.

Rubus strigosus Michx., Fl. Bor. Am., 1, 297 (1893),

9257, Birchim, Porter Co., Ind., Porter Co., (Deam), Lake
Co., (Deam), 10210 Mineral Springs. Common throughout the
region.

Batidaea heterodoxa Greene l. c.

Clarke (Umbach).

Batidaea vulgaris (Linn.).

Rubus idaeus Pliny 16:37, also Tragus, Matthioli, Anguillara
etc., etc., also *Rubus idacus* Linn., Sp. Pl., 492 (1753), *Batos idacus*
Diosc., 4:39. *Batidaea idea* (Linn.)

Found escaped near Hudson Lake.

MELANOBATUS Greene, l. c. 243.

Melanobatus occidentalis (Linn.) Greene l. c.

Rubus occidentalis Linn., Sp. Pl., 493 (1753).

Lake Maxinkuckee (Clarke), 9136 S. South Bend, 11669
Mineral Springs. Common also at Notre Dame and throughout
the region.

Family 90. **SANGUISORBEAE** Spreng., Anleit. ed.

211, 861 (1818).

Sanguisorbac Juss., Gen., 336 (1789), *Sanguisorbaceae*.

EUPATORIUM Dioscorides 4:41.

Eupatorium Tragus, Matthioli, Fuchs, Dodonaeus, Cordus,

Castor Durante, Lacuna, Turner, Tabernaemontanus, Lobelius, Thalius, Gesner, Anguillara, Columna, Brunfels, Pliny, 25:6, etc., etc., *Agrimonia* Brunfels, Dodonaeus, Lonicer, Caesalpinus, Linn. Gen., 138 (1737), 206 (1754) Tours., Els., 251 (1694), I. R. H., 301 (1700).

Eupatorium molle (T. and G.).

Agrimonia mollis Britton, Bull. Torr. Cl., 19, 221 (1892).

Agrimonia Eupatoria var. *mollis* T. and H. Fl. Am., 1. 431 (1840).

Found in Lake Co. 11636 Mineral Springs, 11442 S. E. Notre Dame, 10303 S. South Bend.

Eupatorium hirsutum (Muhl.).

Agrimonia Eupatoria var. *hirsuta* Muhl., Cat., 47 (1813),

Agrimonia hirsuta (Muhl.) Bicknell, Bull. Torr. Cl., 23, 509 (1896),

Agrimonia gryposepala Wallr., Beitr. Bot., 1. 49 (1842).

Lake Maxinkuckee (Clarke), Porter Co., (Deam), 11260, 11698 S. South Bend, Ind., 1886 Notre Dame, 10465 Bertrand, Mich., Berrien Co.

Eupatorium rostellatum (Wallr.)

Agrimonia rostellata (Wallr., Beitr. Bot., 1. 42 (1842), *Agrimonia parviflora* DC. Prod., 2, 588 (1825) not Soland (1789).

11700 S. South Bnd, Ind.

Eupatorium parviflorum (Soland.).

Agrimonia parviflora Soland., Ait., Hort. Kew., 2, 130 (1789).

Millers (Umbach), Michigan City (C. D. Mell), Lake Co. (Deam.)

(To be continued.)

QUAMOCLIT SLOTERI.

BY J. A. NIEUWLAND.

Whatever view be taken of the status of the remarkable plant produced by Mr. Logan Slotter in crossing *Quamoclit coccinea* (Linn.) Britton (*Impomoca coccinea* Linn.) with *Quamoclit vulgaris* Choisy (*Impomoca Quamoclit* Linn.) we have beyond doubt a plant which if found in the field without any knowledge as to its origin, we must admit that the most conservative botanist would scarcely hesitate to report it as a new species. The hybrid in question breeds true to type and was produced between the former as

pistil parent and the latter as pollen parent. The plant differs in having laciniately cleft leaves with linear to lanceolate divisions very irregular so that few are quite alike in shape. The venation in the upper part of the leaf is of the pinnate type but the leaf blade as a whole is broader than long, the basal veins branching on the pedate plan. The base is obtuse and without mesophyll on the margin without, as the veins proceed from the apex of the peduncle directly. This peculiarity is probably due to the tendency of the product to attempt to follow as nearly as may be, the pinnate leaf type of *Quamoclit vulgaris* and at the same time also that of *Quamoclit coccinea*, the apical lobe usually being the broadest. The sepals are rounded to obtuse and even retuse (mucronate) and about as long as in the former plant but broader. The corolla is of the same color, roundish pentagonal, shaped nearly as in the latter species the flowers being much larger than in either parent. The flowers are as numerous to the cluster as in *Q. coccinea*, the peduncles longer, the petioles as long. Though the plant seems not notably prolific in moister situations the abundance of flowers is quite remarkable.

The plant is a good and not very common example of what has been called a "species hybrid" as distinguished from a Mendelian hybrid, or a "mutant." Professor E. C. Jeffrey¹ considers mutants and we would infer also "species hybrids" as just "crypto hybrids," because as the result of his investigations these plants are notably devoid of perfectly fertile numerous microspore cells. As the plant in question does not produce much seed such might probably be the case with its pollen. The test for hybridism according to the writer is found in the fact that partial infertility is the characteristic of the plants supposed to be mutants even when they reproduce at all, thus reducing these plants to the condition practically of sterile or partially sterile hybrids as was maintained by the English horticulturalists of a century ago.² Herbert,³ however, at the same time having produced hybrids that bred true to type and differed from their parents by characters notably different so as to be considered specific differentiations, viewed these products as new species in opposition to the general opinions of his day. Not having examined the pollen of *Quamoclit*

¹ Jeffrey, E. C., Spore Conditions in Hybrids and the Mutation Hypothesis of De Vries, Bot. Gaz. LVIII, 322 (1914).

^{2, 3} See Transactions Hort. Soc., London Vols. I—VII (1812 et seq.)

Sloteri no opinion could be proposed here, but it may be suggested that the apparent infertility or partial fertility of the plant may be due perhaps also to the fact that it has not been grown in conditions suitable. Its production of flowers increases very noticeably as also its seed product by reducing its moisture. The plant might perhaps be quite fertile under conditions which may have not as yet been perfectly determined. Perhaps too under natural conditions comparatively few new species have survived, apparently because the conditions for their proper persistence were not at hand.

Since the plant, *Quamoclit Sloteri* possesses characters that are notable enough to make it seem specifically distinct from either parent and from all of the members of the genus; why should the knowledge of its ancestry militate against it as deserving a "species" name in binary nomenclature? With its character of breeding true it deserves to be ranked as a new plant as truly as the mutants or new species published under *Oenothera* during the last decade. It is likely that many species unequivocally ranked as such found in the field, have fewer characters of distinction than the plant in question.

In reading over a description of a certain *Quamoclit multifida* Raf. (1835) I was forcibly struck by the fact that the characterization of this plant is practically identical with that of the plant produced by Mr. Sloter, from whom the details of the origin of *Quamoclit Sloteri* were directly obtained. The following description from Rafinesque's New Flora of North America, Part IV, p. 57 (1836) seems so remarkably applicable that one would fain believe that that keenly observant and brilliant botanist of nearly a century ago had in mind and actually seen somewhere in gardens of his day a plant identical with the Scarlet Climber just described. It is not impossible that it has appeared spontaneously in gardens where the two parents were often grown together. The whole description of Rafinesque is here given so that it may be compared by the reader, who may judge for himself as to their identity. To us there seem little doubt that Rafinesque knew of a plant whose description agrees in our opinion quite well with that of the plant hybrid under discussion.

"976 *Quamoclit multifida* Raf. Twining, smooth, leaves multifid, lacinate, base truncate, sinuses obtuse, segments linear and lanceolate acute, peduncles 3-5 flors, equal to petiols, calix acute a

curious sp. deemed a garden hybrid produced by *Q. coccinea* and *Q. pinnata*, leaves variously cut few alike, some reniform with shorter cuts, flowers handsome, large purple, tube clavate, limb flat stellate pentagone, stamens exserted. Seen alive in gardens, where sometimes spontaneous."

The *Quamoclit pinnata* Raf. above is certainly *Ipomoea Quamoclit* Linn., Sp. Pl., 159 (1753), the only pinnate leaved *Quamoclit* known by him at the time, and it is moreover the oldest binary application of the plant under the genus *Quamoclit* antedating Choisy's name *Quamoclit vulgaris*¹ nine years, unless of course one admits the stupid duplicate binaries like *Quamoclit Quamoclit*.

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CROCION ACHLYDOPHYLLUM (GREENE.)

An Ecological and Anatomical Study.

BY R. M. KACZMAREK.

In "Studies in Viola I" in the AMERICAN MIDLAND NATURALIST in the February issue of 1914 we intimated that the presence or absence of cleistogamous flowers in plants in the genus *Viola*, as hitherto held by most botanists, is becoming a recognized character for classification. It was undertaken to segregate the plants of this group taking into consideration their habit and the number of stamens in the so-called "apetalous flowers" when present. On account of these important characters of distinction we proposed the segregates on the basis of this difference.

We proposed the genus *Crocion* Nieuwland and Kaczmarek² for the stemmed yellow violets of which *V. pubescens* (Ait.)³ is the type. In our opinion the western plant confused by botanists under the name of *V. eriocarpa* (Schwein.)⁴ is really *V. achlydo-*

¹ Whether the *Ipomoela Cardinalis* (Cardinal Creeper) offered by A. Boddington, of New York, is the same as *Quamoclit Sloteri*, I have been unable to find.

² Am. Mid. Nat. III., 8, p. 207-217 (1914).

³ Ait. Hort. Kew. 3, p. 290 (1789.)

⁴ Schwein. Am. Journ. Sci. 5, p. 75 (1822).

phylla (Greene)¹ sufficiently different from the above by its own characters as may be seen by consulting his description. As to the advisability of applying the name *V. eriocarpa* (Schwein.) to the eastern plant even, we would hardly venture too definite a statement as both *V. scabriuscula* (Schwein.), as that plant was formerly known, and *V. pubescens* may or may not have hairy capsules. If the meaning implied in the name is taken as the prime character for substituting the name *V. eriocarpa* (Schwein.) for what was formerly known as *V. scabriuscula* (Schwein.) then one could for the above reason seem scarcely justified in adopting the change.

The use of the name *V. eriocarpa* Schwein., though apparently an older name were scarcely perhaps legitimate because it is not clear that *V. pubescens* variety *eriocarpon*² (Nutt. 1818) is not a different plant. If it were a different plant as would seem from the context of Nuttall's description of his plant and Schweinitz' discussion then the latter's name is a homonym. That the plants are not the same might be interpreted from the attempt of Schweinitz to change the name to *V. scabriuscula*. The argument would be therefore that Nuttall's plant is really nothing more than a hairy fruited variety of *V. pubescens*. The following synonymy would show this interpretation of the matter:—

Crocion scabriusculum (Schwein.) Kaczmarek.

V. scabriuscula (Schwein.) T. & G. Fl. N. A. 1 p. 142, (1838).

V. eriocarpa (Schwein.) Am. Jour. Sci. V. No. 1, p. 75 (1822)
not *V. pubescens* variety *eriocarpon* (Nutt.) Gen. North Am. Pl.
1. p. 151 (1818).

It has been decided to examine the plant anatomically as well as other plants under the old genus *Viola* to ascertain whether there are any ecological and anatomical characteristics that would distinguish them from one another.

ECOLOGY OF THE SEEDLING.

The ovules are anatropous. The seeds of brownish tint measure about 1–1.5 mm. in width and 2–2.5 mm. in length and contain endosperm. In germination the root first emerges from the seed and then the hypocotyl begins to elongate with the result that the epigeal cotyledons, sooner or later, appear above the

¹ Greene, E. L., *Pittonia*, 5, p. 87 (1902).

² Nutt. Gen. North Am. Pl. 1, p. 150 (1818).

surface of the soil, fully expand and begin to perform the functions of assimilation until future foliage leaves appear; then they finally wither and leave two scars in older seedlings opposite the rhizome. This rhizome arises partly from the epicotyl and partly from the hypocotyl. The lower margins of the scars are joined by a shallow line traversing the ventral face of the rhizome. The cotyledons of seedlings examined were more or less, ovate to orbicular in outline with a tendency toward a better development of one half of the lamina. The apices of the cotyledons are notched and a faint yet quite evident mid-rib runs from the apex of the cotyledon to its base. Between the petioles of the cotyledons a very small bud or growing-point pyramidal in shape constitutes the plumule or epicotyl. The plantlet with all the essential organs of vegetation namely primary root (Fig. 1-4, Pr.), hypocotyl (Fig. 1, Hl.), cotyledons with their petioles (Fig. 1, Cot.), and the epicotyl begin subsequent development the rate of which depends upon the appropriation of food entirely from without. Very little food was stored in the cotyledons. Sooner or later after the cotyledons are exposed to the light there are noticeable changes manifested not only in length but also in diameter of all the plant parts. The hypocotyl, however, at first very delicate of nearly equal diameter, begins to expand at the upper extremity gradually tapers as it nears the primary root so that both form a more or less elongated cone with base below cotyledons and apex at the distal end of the primary root. The root soon develops many lateral branches beset with root-hairs. The development of foliage leaves from the tissue of the epicotyl proceeds rapidly (Fig. 3A and B). The leaf originates from the node in the axis between the petioles of the primitive leaves and is then carried upward by the development of the lower internode due to vertical expansion. Later, however, there is in the axis of the raised node another leaf formed which is soon separated from the lastly formed leaf and node by tissue that forms another internode. So there is an internode formed after each successive nodal formation differentiating the stem into nodes and internodes.

The hypocotyl which until now together with the primary root was approximately in the same vertical plane with it, begins to bend upon itself assuming as it does so a more or less horizontal position, dragging toward the ground its apical part. Once under ground the whole of the hypocotyl with a portion of the epicotyl

begins a rapid growth in thickness. The increase in thickness is confined chiefly to the region where the hypocotyl becomes continuous with the epicotyl. The former soon begins to produce secondary roots and these are confined mainly to the lower part. With the appearance of secondary roots, the primary root begins to wither or rot and it is represented in seedlings of further development as a black filament or scar (Fig. 2). Fig. 3 A shows what is left of it in the second season of growth.

Although the hypocotyl with that part of the epicotyl that becomes subterranean, assumes a diageotropic position or a position of equilibrium, the primary root maintains and the secondary roots assume a downward growth. It is from this underground diageotropic portion of the seedling that the rootstock develops, the product of the hypocotyl and a part of the epicotyl (Fig. 3-4), the former soon disappearing. If the seed is already underground the hypocotyl when covered with dead leaves or other debris elongates until the cotyledons are exposed to the atmosphere. There are then produced secondary roots from the hypocotyl not far from the cotyledons when the remaining part of the hypocotyl together with the primary root decays. As the plant ages the nodes and internodes become more or less horizontal and give origin to many adventitious roots. The more or less transitional development of the seedling is shown rather clearly in Fig. 1-4.

VEGETATIVE PROPAGATION.

During the spring and early summer of the year 1912 and 1913, while studying the cleistogamous flowers of the violets together with the ecology of seedlings and their structure and the anatomy of mature plants of some of the violets of this region there was found besides some interesting facts regarding the habits and anatomy, one peculiarly characteristic of the plant, namely, that of vegetative propagation. Vegetative propagation, in the sense applicable to this plant and to *Crocion pubescens* (*Viola pubescens* Ait.) is possibly shown by others of the same groups also is although not uncommon nevertheless quite rare in the manner about to be described.

While gathering seedlings of this plant in St. Mary's Ravine, Notre Dame, Indiana, one mile west of the University of Notre Dame, that this fact was first brought to our notice. Seedlings

varying with age were gathered and among them were some plantlets the roots of which seemed so old and large as to excite suspicion that they were not real seedlings of the previous season's germination. On tracing the course of the roots it was found that they were those of a central mature plant towards which they radiated inward from all directions. In the majority of cases the plantlets seemed to take origin from roots that had decayed or were decaying and had been severed from the parent plant. Once or twice only was it found that the root that bore a plantlet still had a pronounced communication with the parent, though the region around the origin of the plantlet showed a rather unhealthy condition. This phenomenon, however conclusive called for actual experimentation in order to substantiate former observation in the field.

A number of roots, preference given to those that were fully mature and in normal state of health, taken at random and gathered from many parents not in close proximity were planted in our laboratory in boxes. The greatest precautions were used in taking soil specially sifted and selected so as to exclude seeds of violets. Placed in the light, the ground was kept under conditions of moisture and light as near as possible to those of the natural habits of plants. From time to time the roots were examined to see whether they would show such characteristically localized regions of decay, as seen in those in their natural conditions and surroundings prior to giving rise to young plants. In about three weeks degeneration occurred in the cut ends of the majority. It is from this partially decayed part of the root that a bud soon appeared made up of scales and followed by one or two well developed leaves. This showed conclusively that the violet reproduced new plants vegetatively from old roots.

Among the many parts of seedlings and mature plants brought up in paraffin were included besides the mature healthy roots, roots showing different stages of decay with some bearing plantlets for comparative study of the fibrovascular arrangement and also to investigate the region of plantlet origin. The fibrovascular arrangement was alike in roots showing decay and in those perfectly normal (Fig. 13 14). The plantlets originate from the region surrounding and including the pericycle. The anatomy of these propagated plants was not further studied after determining that they were more or less like seedlings themselves in structure. Fig. 5 shows two old roots severed from the parent,

the upper one bearing two young plants one some distance from the other at the distal extremity; the lower one, in which decay took place at the extremity next to the parent, bears but one plant. Study of *Lophion striatum* (*Viola striata* Ait.) seems to indicate that this process of vegetative propagation takes place also from its roots though no experiments were made to determine this beyond doubt. Subsequent observations of yellow violets in the field show that vegetative multiplication is very common in the members of the *Crocion* group.

THE ANATOMY OF THE SEEDLING.

THE PRIMARY ROOT. (Figs. 6-7).

In cross section the single vascular bundle (stele, central cylinder) of the primary root (Fig. 6-7) is well marked being of the radial type with leptome (phloem) on either side of the hadrome (xylem). The hadrome arrangement is diarch exarch; that is, the initial hadrome vessels (protohadrome, protoxylem) are found externally to the subsequent hadrome vessels (metahadrome, metaxylem) which are formed centripetally. The first hadrome vessels developed are of the spiral and annular type of small lumen with the former in the majority. The tracheae of the metahadrome though larger in caliber possess the same markings that the initial tracheae. The vascular bundle is limited externally by a single layer of cells, forming a continuous membrane, the pericycle. This is homogeneous, formed of thin-walled flattened parenchymatous cells which are bounded externally by the endodermis which encloses the stele.

There is soon developed from the embryonal meristematic tissue the procambium a region of actively dividing cells the secondary meristem or cambium found between the protohadrome and protoleptome giving rise subsequently to secondary hadrome on the inner side and secondary leptome on the outer side.

The extrastelar fundamental tissue (periblem, primary cortex) is limited internally by the endodermis inclusively and externally by the epidermis exclusively. The endodermis is composed of a single layer of cells which show in cross section suberization along their lateral walls. The endodermis in vertical section is differentiated from the cells within by elongation in the vertical direction and are somewhat narrower than the cells immediately exterior.

The cells composing the periblem are parenchymatous with cellulose walls more or less polyhedral in outline and elongated vertically. In older specimens the cells become more or less irregular in outline with intercellular spaces and contain few starch grains. The hypodermis is composed of a single layer of cells. These differ from the inner cortical layers of cells in having their cell walls thickened and more so on the lateral and external walls. (Fig. 6 Hy.)

The epiblema is composed of a single layer of cells which are somewhat longer anticlinally. The cuticularisation is much more pronounced than in the cell walls of the hypodermis. The epiblema of more advanced primary roots shows quite an amount of cutin on the outer walls of the cells, where it gives rise to a layer of, more or less, equal thickness (cuticle) (Fig. 6-7 Ep.).

THE HYPOCOTYL. (Fig. 8).

The cross section of the hypocotyl (Fig. 8) was made a little below the petioles of the cotyledons. The intrastelar tissue although presenting no peculiarities different from those of the well advanced primary root, shows much greater secondary changes. As in primary roots, the prototeptome abutting on the endodermis is still visible though gradually diminishing in size due to the encroachment of the secondary leptome. The proto- and metahadrome vessels are surrounded by secondary hadrome vessels of increasing caliber toward the cortex. The secondary tracheae are mostly of the spiral and more rarely of the scalariform type. The endodermis which is composed of very irregular cells is very distinct. The cortical parenchyma differs in no way from the cells of the periblem of the primary root as to structure but there is a noticeable increase in size of the cells of the former. Chloroplastids are confined chiefly to the layers of the cells exterior to and bordering upon the endodermis and intercellular spaces are scattered throughout the cortex. The cells of the epidermis show a marked cutinization on the lateral as well as outer and inner faces.

COTYLEDONS. (Fig. 9).

The petioles of the cotyledons are somewhat flattened along their ventral and dorsal faces. The epidermis is composed of thick-walled cells in which they are anticlinally larger than periclinally. The ground substance is composed of thin-walled, many-sided,

parenchymatous cells rich in chlorophyll and with no intercellular spaces. The chlorophyll is confined mainly to the periphery. The centrally placed fibrovascular bundle is of the collateral type with the hadrome facing the upper or ventral face and the leptome pointing toward the lower or dorsal face.

On either side of the main fibrovascular bundle close to the lateral margins of the petiole and along the same plane are situated, among the parenchyma cells two strands of incomplete wood-bundles (Fig. 9 Vs.).

The cotyledons themselves (Fig. 10-11) in structure are of the bifacial type. In cross section the internal ground-tissue (mesophyll) is composed of thin-walled parenchyma cells of different outline. Just under the upper epidermis (Ep.) there are two rows of more or less elongated cylindrical cells which form a rather compact palisade-tissue; while the cells of the spongy parenchyma, filling the lower half of the ground-tissue, are less regular as to shape and arrangement. Due to this irregularity the intercellular spaces are much larger in the spongy tissue than they are in the palisade tissue, but there is, nevertheless, free passage from the lower to the upper epidermis. All the cells of the ground-tissue are rich in chlorophyll. In the fibrovascular bundles the hadrome (Had.) is placed superiorly next to the palisade tissue with respect to the underlying contiguous leptome (Lep.) next to the spongy parenchyma. The epidermis is composed of thin-walled cells in which different stages of formation of stomata may be observed communicating, when fully developed, with the chlorenchyma by intercellular spaces. (Ep.-Ep', the former the upper the latter the lower epidermis). A surface view of the epidermis (Fig. 11) shows cells containing many protoplasmic granules confined close to the walls. The elliptical stomata average about 630μ distant from one another, and the structure of the upper face differs in no essential way from that of the lower. The epidermal cells in surface view range from $315-540\mu$ in width and from $630-1008\mu$ in length.

THE EPICOTYL. (Fig. 12).

The fibrovascular structure (mestome) of the epicotyl presents characters different from those of the hypocotyl. The mestome is arranged into four, more or less, separate strands of no definite shape with secondary meristem occupying the position between

hadrome and leptome forming open collateral vascular bundles. The intrastelar fundamental tissue is composed of thin-walled parenchymatous cells varying in size with no marked elongation in any direction. The tracheae are spiral, annular, and scalariform in type, the last mentioned are only occasionally met with.

The endodermis limiting the stele is much more conspicuous than in the hypocotyl both as to uniformity of shape and to the lateral suberization of the cellwalls which, in cross section, appear as dark spots. The remaining cells of the extrastelar fundamental tissue are thin-walled, polygonal in outline and well filled with starch. There are no intercellular cavities found either in the cortex or medulla. Cutinization is so pronounced in the cells of the epidermis that the cell cavities are remarkably reduced.

ANATOMY OF THE MATURE PLANT.

THE ROOT. (*Fig. 13-14*).

The dermatogen (*Fig. 13*) is composed of cells which have cuticularised to some extent along the lateral and inner walls and to such an extent along the outer walls that the cuticular membrane so formed becomes stripped off at irregular intervals forming surface projections. The length of the cells is approximately twice their width. The cells of the hypodermis differ in no marked degree from those of the dermatogen in size; their cell walls, however, are not very much thickened. The entire extrastelar ground-tissue is composed of rather large polygonal thin-walled parenchymatous cells very much elongated along their vertical axes containing many protoplasmic granules, and an abundance of starch grains which are found as far outward as the epidermis inclusive (*Fig. 13 St.*). Calcium oxalate crystal aggregates are very common. Two layers of cells next to the hypodermis as seen in longitudinal section (*Fig. 14*) are from 3 to 5 times as long as broad, the others though of the same width as the former are from 6.5 to 10 times as long. The endodermis though not very distinctive is readily recognized from the rest of the extrastelar fundamental tissue without and from the adjoining tissue within.

The pericycle, well marked in young roots, loses its characteristic appearance partially or entirely, so that it is only occasionally able to be differentiated in older roots. The secondary changes in roots that are quite mature are most evident in the hadrome of the fibrovascular bundle where it occupies the entire central portion

of the stele. The larger vessels of the hadrome are mostly reticulately pitted (Fig. 14, 8 and 2) and scalariform pitted (Fig. 14, 1). The articulations of the reticulate vessels where the absorbed transverse walls existed are not uncommonly met with (Fig. 14, 8, 2). The vessels of small caliber are usually of the spiral, reticulate and occasionally of the annular type. Sclerenchymatous tissue (wood-fibres) (tracheids) were always found to be present in old roots. The fibres (tracheids) are about 20 times as long as they are broad, tapering at each end and establishing communications with one another by pits. The leptome is not well developed in which the tubes with rugged walls are from 5—10.5 times longer than they are broad.

The longitudinal section of the old root (Fig. 14) shows these in order from without inward, dermatogen Ep., hypodermis Hy., periblem Cp., endodermis En., pericycle Pc., leptome L., and lastly hadrome H., composed of scalariform pitted (1), reticulately pitted (8-2), spiral (4), and annular (6) vessels, with two strands of wood fibres. (3).

THE RHIZOME. (Fig. 15-16).

The cell structure of the epidermis possesses the same external wall thickenings that the dermatogen of the root. Immediately under the epidermis are the cells of the hypodermis which are nearly twice as long as broad and as shown in longitudinal section (Fig. 16) together with the epidermis are being replaced by cork tissue (Co) formed from the newly developed phellogen (Ph). The periderm is composed of thinner-walled parenchyma cells (Phelloderm) toward the inside (not shown in section) and brick-shaped cells with suberized walls in very close union toward the outside separated by the cork-cambium. The outer cortical parenchyma is not as compactly arranged as that nearer the stele. The cells vary in shape not uncommonly isodiametric, and have much starch. The starch grains are found even in the epidermis. The endodermis stands out clearly both in cross and longitudinal sections, differing in no way from that of the root.

The fibrovascular bundles are of the collateral type with hadrome inferior to the leptome the former appearing as a solid hollow cylinder (Siphonostele). The sieve-tubes reach but half the elongation that they do in roots, and are less symmetrical as to their lateral wall arrangement. In cross section

the hadrome vessels have a brick-like arrangement, the entire strand of continuous circumference enclosed the central pith. The tracheae though differing in lumen are mostly all of the reticulately pitted type, at times, however, spiral and annular vessels are found. In the rootstock the reticulately pitted vessels are much shorter in length than in roots, with cross wall markings as plainly evident as in the latter. The medula is composed of rather thin-walled cells very rich in starchy deposits. Calcium oxalate crystals are quite abundant in both the intra- and extrastelar fundamental tissues.

THE STEM. (*Fig. 17-18*).

The mestome bundles are open collateral with hadrome endarch tetrarch. The cambium is confined to the bundles between the leptome on the outside and the hadrome on the inside (intra-fascicular cambium) being interrupted by the seeming equality of the intrastelar fundamental tissue, in which case the interfascicular cambium (between the bundles) is hardly at all developed constituting, more or less, an interrupted cambium ring. The bundles are more or less circular in cross section. The ducts of the protohadrome are of small diameter mostly annular, and pass gradually to those of the metahadrome and secondary hadrome with large caliber and spiral in type. The scalariform pitted ducts are only occasionally found. The cells of the hadrome parenchyma are thin-walled and elongated along the vertical axis of the stem (*Fig. 18 W*). The leptome tubes are approximately 10 times longer than broad, of thin walls, and are associated with the companion cells with similar walls attaining but half the length of the cells. The cells of the medulla increase both in width and length as they reach the centre of the cylinder remaining thin-walled throughout their existence. Crystals of calcium oxalate are found within the pith.

The endodermis composed of cells of about the same length as breadth with starch grains limits the stele dipping somewhat toward the medulla between the fibrovascular strands. The cells of the cortical region are all parenchymatous and no sclerenchyma was found. Chlorophyll is confined mostly to the outer cells of the cortex, and small intercellular spaces are present throughout this region. The epidermal and the underlying hypodermal cells, including possibly the cells of the third layer, are much alike as to size, shape and arrangement.

The hairs of the stem are epidermal in origin, confined mainly to the ridges of the stem (Fig. 19 E.), are formed as outgrowths from single superficial cells. In all the hairs examined protoplasm was found to be present containing besides a nucleus with its centrally placed spherical nucleolus, granular deposits (Fig. 19 A.). The hairs, cylindrical in outline with a broad base gradually tapering toward the apex, have their surfaces marked with thickenings obliquely to the vertical axes. (Fig. 19 C.).

LEAF.

PETIOLE. (*Fig. 20-21*).

The petioles in cross section are more or less semicircular in outline. The hadrome vessels are spiral and annular with increasing caliber toward the cortical tissue. The narrow companion cells are scattered among the sieve-tubes with heavy cross walls (Fig. 21). The pith is composed of medium-sized cells with many intercellular spaces. The endodermis in cross sections forms nearly a perfect circumference about the stele, while in longitudinal section the cells differ very much in height and thickness (Fig. 20-21 End.). Chlorophyll is scattered throughout the extrastelar fundamental tissue as far inward as the endodermis inclusive, with starch grains and calcium oxalate crystals confined mainly to the inner part of cortex. The cortical parenchyma cells increase in size toward the endodermis. The two lateral vascular bundles one on either side of the central bundle possess vessels of the same type as those of the latter, and nothing equivalent to an endodermis sheath.

BLADE. (*Fig. 22*).

The transverse section of the blade (Fig. 22) was made at about the centre of a fully developed leaf. The chlorenchyma is composed of a single layer of palisade cells compactly arranged abutting the upper epidermis, and loosely arranged parenchyma cells next to the lower epidermis, separated from one another by large intercellular spaces. The striking character of the mesophyll is the abundance of chlorophyll. The layers of cells immediately under the upper and lower epidermis, 4 or 5 rows in the former and 1 or 2 in the latter region, at opposite sides of the central bundle, are thick-walled (collenchyma) and usually devoid of chlorophyll. The spongy parenchyma viewed from the lower face has many intercellular spaces (Fig. 23). The central wood-

bundle is collateral at the base of the leaf with hadrome next to the palisade tissue, and becomes more or less concentric toward the apex. Cutinization is quite marked in the cells of the lower and upper epidermis. Comparing the face view of the lower and upper epidermis we find that the cell walls of the former are undulate while those of the latter are straight. The stomata, more or less elliptical, are nearly alike as to outline on both faces, those on the lower outnumbering those on the upper face. (Fig. 24-25, upper and lower epidermis respectively).

THE FLORAL LEAVES. (Fig. 26, a, b, c).

The hairs are simple formed from single cells in which the external wall protrudes giving the fully developed hairs a characteristic club shape (clavate) (Fig. 26 c). All the hairs are not of equal length, nevertheless all are notably clavate. They were well filled with protoplasm in which many granules were present (Fig. 26 a). The cell wall of the hairs has markings similar to those found on the hairs of the stem (Fig. 26 b). The epidermis even in so delicate a member as a petal has rather thickened cell walls.

The sub-epidermal tissue is made up of thin-walled parenchymatous cells (Fig. 26 a Sub.). The section of the petal was made at right angles to its length in all cases in Fig. 26.

RESUMÉ.

The following facts are characteristic of the plant:—

1. The rootstock is developed from the hypocotyl and part of the epicotyl, some of the former, however, soon disappears.
2. The development of plantlets from old roots by "vegetative propagation" from the region surrounding and including the pericycle. Vegetative propagation was found to be common in the members of the *Crocion* group.
3. In primary roots the plerome, at all times, was diarch.
4. In mature plants the secondary changes are most evident in the hadrome part of the mestome. It is noticeably large and compact in the rootstock and divided with the leptome in the stem into more less distinct strands.

EXPLANATION OF FIGURES.

Fig. 1. Seedling of *Crocion achlydophyllum* (Greene) Nwd. and Kacz., showing secondary branches (Srb.) of the primary root (Pr.), hypocotyl (Hl), petioles (Pet.) and their cotyledons (Cot.).

Fig. 2. Seedling further advanced than in the preceeding figure. The primary root is degenerating (Pr.) showing also secondary roots (Sr.), cotyledon scars (Cs.), leaf scars (Ls.) and stipular scales (Ss.).

Fig. 3. Lateral (A) and front (B) view of seedling in the second season's growth. (Pr.) remnant of the primary root, (Sr.) secondary roots, (R. H.) rootstock (rhizome), (C. S.) cotyledon scars, (F.L.) leaf scar (I.N.) first internode, (I.N'.) second internode, (S.S) stipular scales, and (L) young leaf.

Fig. 4. A much advanced seedling showing (L.S.) leaf scars which mark plainly the nodes and internodes of the rootstock. (S.R.) Secondary roots, (C.S.), cotyledon scars and (P.R.) primary root.

Fig. 5. Old roots in the state of degeneration giving rise to plants by "vegetative propagation."

Fig. 6. Cross section of primary root. (Ep.) epidermis, (Hy.) hypodermis, (Cp.) cortical parenchyma, (End.) endodermis, (Pe.) pericycle, (Phad.) protohadrome (protoxylem), (Mhad.) metahadrome (metaxylem), (Lep.) leptome (phloem).

Fig. 7. Cross section of a primary root somewhat advanced in growth showing a fibrovascular supply to a lateral branch (L.B.). (Ep.) epidermis, (End.) endodermis, (Cp.) cells of the cortical region, (P.L.) protoleptome, (Cam.) cambium, (S. H.) secondary hadrome (secondary xylem), (S.L.) secondary leptome (secondary phloem). The protohadrome and metahadrome vessels are represented with heavy dark walls in the centre of the stele.

Fig. 8. Cross section of the hypocotyl. (Ep.) epidermis, (End.) endodermis, (Cp.) cortical parenchyma, (P. Lep.) protoleptome, (Cam.) cambium, (S. Lep.) secondary leptome, (S.Had.) secondary hadrome, (P.Had.) protohadrome and metahadrome vessels, (I.S.) intercellular spaces.

Fig. 9. Cross section of a petiole of a cotyledon. (Vs.) Cells in the state of division to form a vascular strand, one on either side of the centrally placed fibrovascular bundle. (Lep.) leptome, (Had.) hadrome, (Co.) cortical parenchyma, (Ep.) epidermis.

Fig. 10. Cross section of a cotyledon. (Ep.) Upper epidermis, (Pp.) palisade parenchyma, (Sp.) spongy parenchyma, (Ep'.) lower epidermis, (St.) stoma, (Had.) hadrome, (Lep.) leptome.

Fig. 11. Surface view of the epidermis with stomata. Upper and lower faces are alike in all respects.

Fig. 12. Cross section of the epicotyl. (Ep.) epidermis, (Cp.) cortical cells with many starch grains (St.), (End.) endodermis, (Med.) medulla, (Had.) hadrome, (Lep.) leptome, (Cam.) cambium.

Fig. 13. Cross section of an old root. (Ep.) dermatogen, (Hy.) hypodermis, (St.) starch within the cells of the cortex (Cp.), (End.) endodermis, (Lep.) leptome, (Had.) hadrome.

Fig. 14. Longitudinal section of a mature root. (Ep.) dermatogen, (Hy.) hypodermis, (Cp.) cortical parenchyma, (En.) endodermis, (Pe.) pericycle, (L.) leptome, (H.) hadrome composed of scalariform pitted (1),

reticulately pitted (8 and 2), spiral (4) and annular (6) tracheae with two strands of wood-fibres (3).

Fig. 15. Cross section of an old rootstock. (Ep.) Epidermis, (Hy.) hypodermis, (Cp.) cortex cells with starch grains (St.), (End.) endodermis, (L.) leptome, (H.) hadrome, (Med.) pith cells heavily charged with starch.

Fig. 16. Longitudinal section of a rhizome. (Ep.) Epidermis, (Hy.) hypodermis, (Cp.) cortical parenchyma, (E.) endodermis, (L.) leptome, (H.) hadrome in which are shown spiral (c), annular (a), and reticulately pitted vessels of large (f) and small(n) lumen, (St.) starch, (Ph.) phellogen and (Co.) cork.

Fig. 17. Cross section of the stem. (Ep.) Epidermis, (Hy.) hypodermis, (Cp.) cortex cells, (End.) endodermis, (Lep.) leptome, (Had.) hadrome, (Med.) medulla.

Fig. 18. Longitudinal section of a stem. (Ep.) Epidermis, (Hy.) hypodermis, (Co.) cortex, (End.) endodermis, (L.) leptome, (H.) hadrome with wood parenchyma (w), (Med.) cells of the medulla in which calcium oxalate crystal aggregates are found (C.R.).

Fig. 19. Hairs on stem. (A.) internal protoplasm with its nucleus (N), nucleolus (O), and protoplasm granules (Pg.), (Cw.) cell wall. Surface view (C.) showing markings (Sm.). The hairs are confined mainly to the ridges of the stem (E.).

Fig. 20. Transverse section of a petiole of a mature leaf. (Ep.) Epidermis, (Hy.) hypodermis, (Co.) cells of the cortex containing calcium oxalate crystals, (End.) endodermis, (Lep.) leptome, (Had.) hadrome, (Med.) medulla.

Fig. 21. Vertical section of the petiole. (Ep.) Cells of the epidermis with thickened outer walls, (Hy.) hypodermis, (Cp.) cortex parenchyma in which chlorophyll (c), starch grains (H.) and crystals of calcium oxalate were found. (End.) Endodermis with chlorophyll, (Lep.) leptome showing sieve-tubes (St.) and leptome parenchyma (Cc.), (Had.) hadrome with spiral and annular vessels.

Fig. 22. Cross section of the middle part of a leaf showing the fibrovascular bundle of the midrib. (Ep.) Upper epidermis with the underlying layer of 3 or 4 collenchyma cells, (Ch.) chlorenchyma composed of palisade tissue (Pp.) and spongy parenchyma (Sp.), (Ep'.) lower epidermis and sub-epidermal thick-angled cells (Col.), (Lep.) leptome and (Had.) hadrome.

Fig. 23. View of the pneumatic tissue of an old leaf from the under face showing its large intercellular spaces.

Fig. 24. Face view of the upper epidermis of a leaf showing the epidermal cells with straight walls and stomata.

Fig. 25. Face view of the lower epidermis of a leaf and stomata. The cell walls of the epidermis are undulate.

Fig. 26. A cross section of the lateral petal cut at right angle to its length. (a) The internal structure and origin of a hair from one of the epidermal cells (Ep.), (Sub.) sub-epidermal tissue, (b) surface view of the hair showing cell wall markings, (c) low power drawing showing the characteristic clavate shape of the hairs.

V.—CRITICAL NOTES ON NEW AND OLD GENERA OF PLANTS.

BY J. A. NIEUWLAND.

RHAMNUS.

Some of the plants commonly included among the buckthorns had been even before Linnaeus put into a well recognized genus *Frangula*. Their generic standing had been adopted by writers as early as Cusa, Dodonaeus, Matthioli, Haller, C. Bauhin (Prod. 160, 1620), Tournefort, and by moderns as late as Asa Gray.¹ The characterizations by the latter author distinctive from the genus *Rhamnus* are sufficient to need no repetition here.

FRANGULA (Dodonaeus, Pempt., 6:2:25) Trew, Herb. Blackw. also Miller Gard. Dict., 8th Ed. (1768), Duhamel, Traite Arb. Arbustes I, 246 (1875), etc.

Frangula Alnus P. Miller, l. c.²

Rhamnus Frangula Linn., Sp. Pl., 193 (1753).

Frangula caroliniana Asa Gray, l. c.

Rhamnus caroliniana Walt., Fl. Car., 101 (1788).

The genus *Alaternus* might deserve consideration as a genus that may be separated from our aggregate *Rhamnus*. None of the plants are to be found in our region. *Cardiolepis* (*Endotropis*) Raf., Neog. 2, (1825) based on the *Rhamnus lanceolata* Pursh, Fl. Am. Sept., 166 (1814) has but two nutlets in fruit and the parts of the flower in 4's.

APETLORHAMNUS, A NEW GENUS

The presence or absence of petals when a constant character would seem in itself to be a almost sufficient reason to segregate a plant or plant group in to a new genus. Many such lately proposed have not nearly as notable a reason for existence and are accepted by botanists without question. We have been anything but logical in our admission or non-admission of genera. In any ordinary key for the determination of plants the student is loath to find that he must look both among the Apetalae and the Choripetalae and even perhaps the Sympetalae to be able to find

¹ Gen. Pl. 177, vol. II (1849).

² This is the stupid duplicate binary *Frangula Frangula* according to the American codes.

plants of one genus! Such is in fact the case with the generally recognized genus *Fraxinus* of the manuals. About the only notable character that determines such a genus is the uniformity of the fruit. Apply such a principle or set of principles to the orchids and what chaos would result! The characters being considered as constant we can scarcely see that petaliferous and apetalous plants should be left in the same genus.

APETLORHAMNUS Nov. Gen.

Small shrub with branches thornless. Flowers pentamerous, solitary, or 2 to 3 in the axils coming out with the leaves. Petals none: fruit a subglobose drupe with three nutlets, each three grooved.

Arbuscula sine spinis in ramis, floribus cum partibus quinis; singulis vel paucis axillaribus foliis coætaneis: petalis nullis: fructu drupaceo cum nuculis tribus, canaliculatis.

The genus is quite distinctive by its apetalous flowers. Such an important character alone were enough to require its segregation, a character that can not be overlooked.

Apetlorhamnus alnifolia (L'Her.) Nwd.

Rhamnus alnifolia L'Her., Sert. Angl., 5 (1788).

LITANUM

Talinum parviflorum Nutt. differs considerably from the other members of the genus particularly by having only five stamens whereas the others have always at least twice as many. The presence or absence of a whole whorl of the floral organs is a very notable variation in flower structure and about as important as the presence or absence of petals or sepals. The capsule is quite different in shape and accordingly a difference in the placentation from the other plants of the group. This plant differs then as much if not more from its present congeners than does the newly made *Crunocallis* from the other Clayconias.

LITANUM Nov. Gen.

Planta perennis cum foliis teretis linearibus basi dilatatis: pedunculis tenuibus, floribus cymosis parvis, sepalis brevioribus ovatis, acutis: staminibus 5, vel paucioribus, stylo staminibus longiore: capsula elliptica.

Litanum parviflorum (Nutt.) Nwd.

Talinum parviflorum Nutt., T. and G., Fl. N. Am. I, 197 (1838).

MUSCARI.

In the Illustrated Flora¹ Dr. Britton has permitted the name *Muscaria* Haw. for the genus of plants typified by *Saxifraga muscoides* Wulf. in spite of the fact that there is an older *Muscari* Miller² accepted in the same work. Surely if *Elodes* Adanson (1763)³ in the same work renders the *Elodes* Michx. untenable then the *Muscaria* Haw. seems a perfect analogy. Both differ by exactly the same variations and a more exact case can scarcely be imagined. Unless one prefers to be dogmatic and arbitrary in matters of nomenclature, one can scarcely be looked upon as logical in accepting a name in one case and discarding another in a perfectly similar instance, and for reasons no bit the better or worse. It is probably better to look on the instance of the retention of *Muscaria* Haw. as an oversight that could not have come intentionally from a botanist as keen in matters of nomenclature as is the author of the Illustrated Flora.

That the names are identical is evident from the fact that the monocotyledonous plant name was corrected by Salisbury to *Moscharia*⁴ which sounds quite the same inspite of its varied spelling; for it is the pronounced name that constituted the homonym. Though as far as we can find there has been no other name suggested for the *Saxifraga* segregate as a genus caption we suggest that of **Dactyloides** under which it first appeared as a section or subgenus.

DACTYLOIDES (Tausch) Nwd., Nom. Nov.

Muscaria Haw., Saxifr. Enum., 36 (1821), not *Muscari* P. Miller (1768) l. c. *Triplinervium* Sectio Gaudin, Fl. Helv., III, 116 (1828), *Dactyloides* Section Tausch, ex DC. Prod., IV. 23 (1830).

Dactyloides muscoides (Wulf).

Saxifraga muscoides Jacq., Coll. II, 123. *Muscaria muscoides* Haw. l. c.

Dactyloides caespitosa. (Linn.)

Saxifraga caespitosa (Linn.) Sp. Pl., 404 (1753)., *Muscaria caespitosa* Haw. l. c. 37.

¹ Britton, N. L., III. Flora, II, 222 (1913).

² l. c. I, 510 (P. Miller, Gard. Dict., 8th Ed. (1768).

³ l. c. I, 104, II, 537.

⁴ Salisbury, R., Gen. Pl. Frag., 25, (1866).

HOUSTONIA SEGREGATES.

The group of plants aggregated with *Houstonia* and having flowers in typical cymes, and funnel shaped corollas have beside, a habit so different from the rest that they well deserve separate generic rank. Rafinesque as early as 1820¹ had suggested the division of the group into several subgenera, and it is one of his names which had actually been taken up by Steudel² and is here selected for the group. There is as great a difference between these plants and the typical *Houstonias* as between *Diodia teres*³ and typical *Diodias* the former lately segregated as a genus. These latter can in fact be scarcely said to differ as much in habit.

Chamisme (Raf.) Nwd. Nov. Gen.

Plantae perennes aliquando suffruticosis ab *Houstonia* habitu distinctae, floribus dimorphicis purpureis vel lilacinis vel albis, corollis infundibuliformibus, cymis aggregatis. Alia ut in *Houstonia*.

Perennial plants sometimes suffruticose at the base with purplish flowers or pale. Corolla funnel shaped: flowers in leafless cymes terminal.

The perennial often suffruticose habit of these plants is a very notable distinctive character, showing very little resemblance to the tender vernal plants like *Houstonia coerulea* Linn. which is the type of *Houstonia* proper.

Type of the genus *Houstonia purpurea* Linn., Sp. Pl., 105 (1753)

Chamisme purpurea (Linn.) Nwd.

Houstonia purpurea Linn. l. c.

Chamisme ciliolata (Torr.) Nwd.

Houstonia ciliolata Torr., Fl. N. K. S. I., 183 (1824).

Chamisme longifolia (Gaertner) Nwd.

Houstonia longifolia Gaert., Fruct. I, 226, pl. 49, f. 8, (1788).

Chamisme tenuifolia (Nutt.) Nwd.

Houstonia tenuifolia Nutt., Gen., I, 95 (1818).

Chamisme angustifolia (Michx.) Nwd.

Houstonia angustifolia Michx. Fl. Bor. Am. I, 85 (1893),
Oldenlandia angustifolia (Michx.) A. Gray, Pl. Wright. II, 60 (1853).

¹ Rafinesque, C. S., An. Gen. Sc. Phys., XV, 226, 227 (1820).

² Steudel, E. T., Nom. Bot., ed. III, 776 (1840).

³ Small, J. K., Flora of Miami, 174, 175 (1913).

PANETOS Raf.

Houstonia rotundifolia Michx.¹ has been segregated from *Houstonia* by Rafinesque under the name *Panetos*. Considering in addition to the characters given by that author also that of producing numerous cleistogamous flowers a rather unusual thing in this group the genus merits consideration for segregation.

Panetos rotundifolius (Michx.) Nwd.

Houstonia rotundifolia Michx., Fl. Bor. Am., I, 85 (1803).

There are other Mexican and southern members of the genus *Houstonia* that ought to be separated from this aggregate, having flower and habit characters even more notable than those here referred to.

ARONIA MED. A HOMONYM.

On a number of occasions attention was called to the fact that several of Mitchell's names antedated others now commonly held. The publication of *Aronia* by that author is earlier than that of Medicus³ or Persoon.

The *Aronia* of Mitchell is *Orontium* of Linnaeus and though it can not be used as a valid name itself, its previous use renders any subsequent application of the name invalid, whether its first application is admissable or not, according to the rules of the codes. Even if it had a different meaning and origin in deviation it still is exactly identical in sound and spelling.⁴ It is therefore impossible to quibble about the matter for this reason. I have been unable to find that any other name is available as an alternative application. Before the plant was admitted as segregated validly by some, a subgenus or section name was applied by Decandolle, and this may serve as a substitute for the *Aronia* antedated.

ADENORACHIS (DC) Nwd. Nom. Nov.

Aronia Medicus, Phil. Bot., 140 (1789), also Persoon, Syn II, 39 (1807) not *Aronia* Mitchell, Diss., App. I, (1769) = *Orontium*

¹ Raf., An. Gen. Sc. Phys. I. c.

² Mitchell, J., Diss. Brevis de Princ. Bot. et Zool., App. aliquot de Pl. Virg. Obs., Norimb., Imp. Wulfgangii and Schwarzkopffii MDCCLXIX. (See Pritzel No. 6975).

³ Persoon, C. H., Syn. II, 39, (1807), Medicus, F. K., Phil. Bot. I, 140 (1789).

⁴ N. L. Britton, III, Flora, II, 290 (1913), Kuntze, O., Rev. Gen. Pl., II, 720 (1891).

Linn. (1753) Sp. Pl. 324. *Adenorachis* DC. Prod. II, 637 (1825), as section or subgenus.

***Adenorachis arbutifolia* (Linn.) Nwd.**

Aronia arbutifolia (Linn.) Ell., Bot. S. Car. and Ga., I, 556 (1821), *Mespilus arbutifolia* Linn., Sp. Pl. 478 (1753), *Pyrus arbutifolia* Linn. f. Suppl. 256 (1781).

***Adenorachis atropurpurea* (Robinson) Nwd.**

Aronia arbutifolia Britton, Man., 517 (1901), *Pyrus arbutifolia* var. *atropurpurea* Robinson, Rhodora, x, 33, (1908).

***Adenorachis melanocarpa* (Michx.) Nwd.**

Mespilus arbutifolia var. *melanocarpa* Michx., Fl. Bor. Am., I, 292 (1803) *Pyrus melancocarpa* Willd., Enum., 525 (1809).

KYLLINGA A HOMONYM.

The *Kyllinga* Rott.¹ is antedated by Adanson's *Killinga*² the latter a segregate from *Athamanta*. Though the name is slightly different in spelling it is nevertheless the same in sound and on the authority of Brevel³ named after the same Peter Kylling a Danish Botanist. The next available name not only in order but with the same type as that of *Kyllinga* Rottb. itself is *Thryocephalon* Forst. The other names as given in the Kew Index may possibly be attempts at segregation anyhow. Following is the synonymy.

THRYOCEPHALON Forst., Char. Gen., 129, t. 65 (1776).

Kyllinga Rottb. l. c. (1773), not *Killinga* Adans. l. c. (1763) nor Brevel, l. c., (1770).

***Thryocephalon pumilum* (Michx.) Nwd.**

Kyllinga pumila Michx. Fl. Bor. Am., I, 28 (1803), *Hedychloe fragans* Raf., Ann. Nat., 16 (1820).

KOCHIA A HOMONYM.

*Kochia*⁴ Roth, is a homonym because of the previous use of *Cocchia* (Mich.) Brevel,⁵ (1770). The letters C and K are the same in Latin, and by all the systems of pronunciation the name

¹ Rottboel, C. F., Descr. Ic. 12, pl. 4, f. 3, 4, (1773).

² Adanson, M. Fam. des Pl., II, 498 (1763).

³ Brevel, J. F. B., De Pl. Cult. Mem. Nom., 40 (1770) "*Killinga* Adans. *Athamanta cret. L.*"

⁴ Roth, Schrader, Journ. Bot. I, 307, pl. 2 (1799).

⁵ Brevel, J. F. B., De. Pl. Cult. Mem., 28 (1770).

has the same sound. The latter name is applied as a proposed segregate with *Sideritis syriaca* Linn., as type. As we are unable to find that any other attempt has been made to name them Chenopodiaceous plant all in the Kew Index being apparently proposed segregates that might at any time be reserved for their proper groups if raised to generic standing it is necessary to give a new one, for which **Bushiola** is proposed herewith.

BUSHIOLA Nwd. Nom. Nov.

Kochia Roth l. c. (1799) not *Cocchia* Brevel, l. c. (1770).

Bushiola Scoparia (Linn.) Nwd.

Kochia Scoparia (Linn.) Roth. Neues Jour. Bot., III, 85, (1809), *Chenopodium Scoparia* Linn., Sp. Pl., 221 (1753).

PROPER PUBLICATION.

That any code putting restrictions for expediency on "starting points" arbitrarily chosen for beginning nomenclature, contains within itself its germs of destruction, will some day be conclusively admitted, as better knowledge and far-sighted logic throw more light on these problems. Nevertheless in matters of plant names we fail to see that a logical structure can not be built on a faulty foundation without ending in chaos. Most of our latest codes and the American with them agree to accept 1753 as the beginning of nomenclature for botany. No generic descriptions having been made in Linnaeus' *Species Plantarum*, the generic names are to be accepted as to their validity for "proper" publication by reference to the *Genera Plantarum* of 1754 with a special provision of code to cover this specific instance. In the Vienna Code rules we are told that "the rules of nomenclature should be neither arbitrary nor imposed by authority," (Art. 3) and then it proceeds in the most high-handed and arbitrary manner to publish over 20 pages of *nomina conservanda* that must be retained; and this because the code makers can give no good reason why they should be. This is done, too, without any attempt at exciting our humorous feelings.

Already, much dogmatic and canonical teaching has gone forth as to what constitutes "proper publication." It is not sufficient that for a validity of a name we be quite certain as to its identity. Among these "canons" required in order that

a name be "properly published" according to certain followers of the American Code¹ we have the one that a genus must have a "reference to a specific description which is associable by citation to a *previously published binomial species*." (Rule 3. Canon 10, Am. Code). In order to make this statement reasonable and logical, it will be necessary again to make an exception in the favor of Linnaeus himself, just as arbitrary as any of the above mentioned cases. Unless we do this, then at least three of the Linnaean genera of the *Species Plantarum* of 1753 were never "properly published," at least by Linnaeus in 1753, namely *Musaenda*, *Erythronium*, *Hydrocharis*.

None of these are published in his work *either with or by direct citation to a binary name*. They are there monotypic, having only the species *Musaenda fructu frondoso*, *Erythronium Dens canis* and *Hydrocharis Morsus Ranac*, and these are *not binomials*, nor were two of them at least *binomials* in the second edition of 1762-3.

Are we then to consider these names as not "properly published?" That the exponents of the code do consider them "properly published" is evident from the fact that they use these names in their floras and manuals as attributed to Linnaeus (1753),² though not perhaps without surreptitious, and may I add perhaps, dishonestly inserted hyphens, in order that the unwary might not suspect. Necker's names may be rejected for a purpose, but Linnaean ones under similar conditions are to be accepted, nor are the descriptions of either author of themselves more than poor, the advantage if any being in favor of Necker. It would seem then that the more we increase the number of "rules" and "canons" of "codes," the more we are obliged to have arbitrary exceptions thereto, thus ending it all in a flood of dogmatic lawlessness, or making confusion worse confounded. When rules are made let the "codists" at least honestly try to keep them.

¹ Bull. Torr. Cl. XXXXII, 117 (1915).

² Britton and Brown, Ill. Fl. N. Am. 1, 505, (1913).

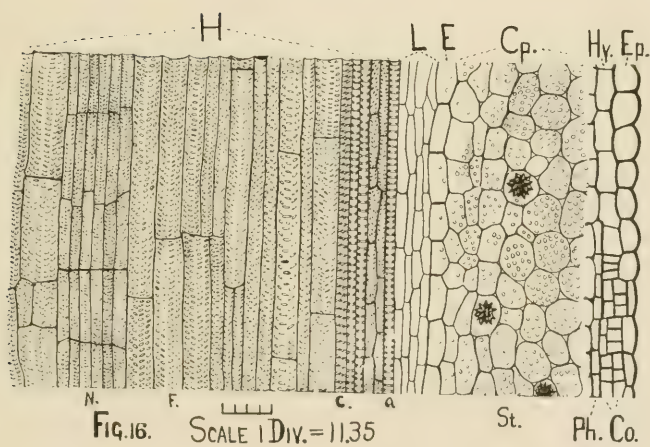
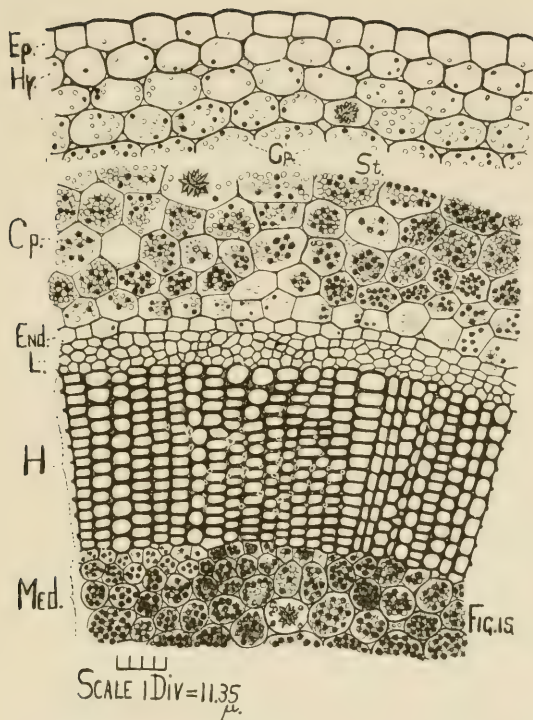
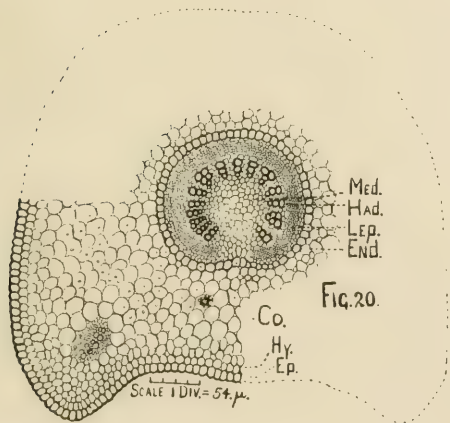
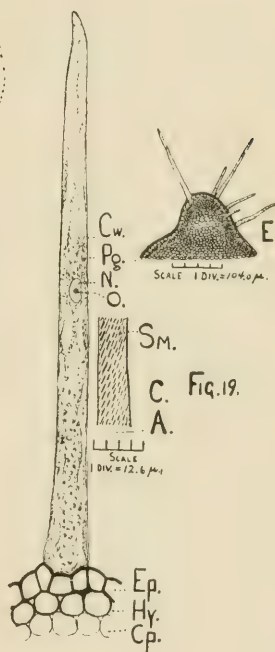
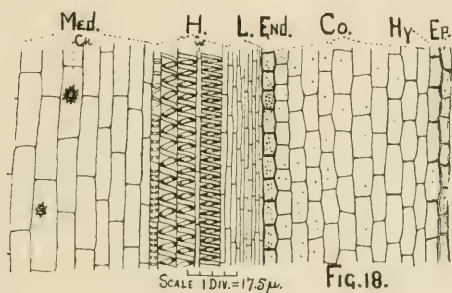
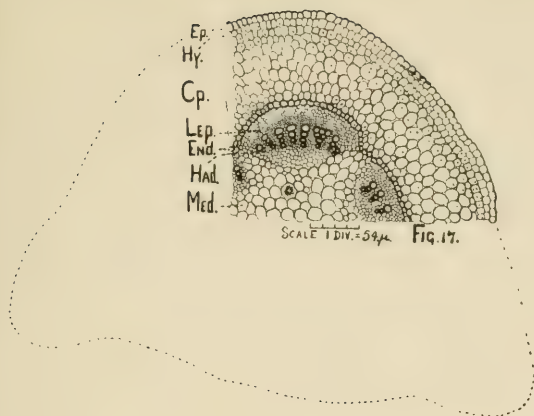
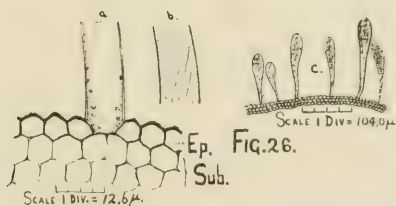
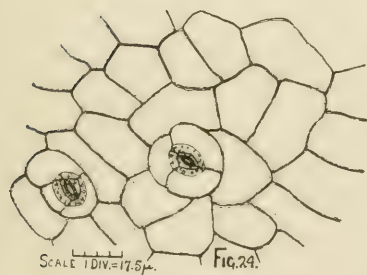
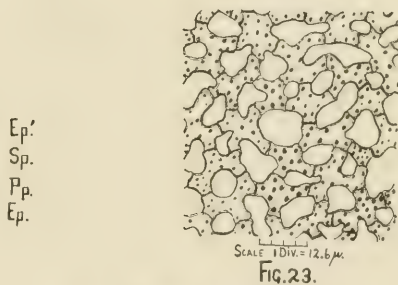
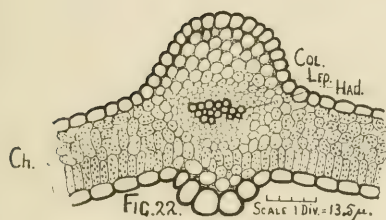
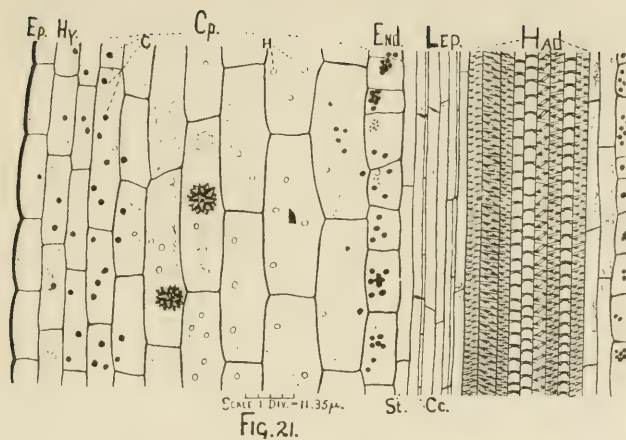


PLATE VIII. KACZMAREK ON CROCION.





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that of the Prairie States

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VOL. IV.

JULY, 1915.

NO. 4.

THE NAIADES OF MISSOURI.—II.

BY WILLIAM I. UTTERBACK.

CATALOGUE OF THE NAIADES OF MISSOURI.

FAMILY I. *Margaritanidae* Ortmann.

1911—*Margaritanidae* Ortmann., Nautilus, Feb.

"Diaphragm incomplete, formed only by the outer gills; outer laminae of outer gills only in part connected with the mantle, posteriorly free for considerable distance. Anterior end of inner gills separated from the palpi by a wide gap. The margins of the mantle do not unite or approach each other anywhere and there is no tendency to form branchial and anal siphons and no supra-anal opening is present. Gills without water-tubes, inter-lamellar connections forming oblique rows. Marsupium formed by all four gills. Glochidia small, semicircular and globular, without hooks, but with irregular, small teeth at the ventral margin."—Ortmann (1912 b, p. 223).

This Family presents the most primitive characters of the *Naiades* and is represented in Missouri by only one species, *Cumberlandia monodonta* (Say), for which it was necessary to create a special genus because of its peculiar gill structure as determined by histological studies. Even in this Family, shell characters are not constant enough to be considered in the diagnosis. Like the sub-families, *Unioninae* and *Anodontinae* of *Unionidae*, the glochidal discharge is effected through the anal opening.

Genus *Cumberlandia* Ortmann.

18912a—*Cumberlandia* Ortmann, Nautilus, XXVI pp 13 and 14.

(Type, *Unio monodonta* Say.)

ANIMAL CHARACTERS:—Diaphragm and supra-anal opening absent; gills long and narrow, inner broader anteriorly than

outer, inter-laminar connections not irregularly distributed but arranged obliquely parallel to each other, outer lamina of outer gill free from mantle posteriorly, inner lamina of inner gill almost entirely free from visceral mass; all four gills marsupial; anterior adductors reinforced posteriorly.

SHELL CHARACTERS:—Shell narrowly elliptical, no sculpture on disk, low beaks sculptured with ridges parallel with growth lines; epidermis black; anterior cardinals lacking, posterior ones conical; anterior adductor muscle scar deeply impressed post-dorsad; nacre pearl blue to white.

Cumberlandia monodonta (Say).

("Spectacle Case.")

Pl. XV. Figs. 28A and B.

1829—*Unio monodonta* Say, N. Harm. Diss., IIp. 293; 1830, Am. Conch I. Pl. VI.

1853—*Margaritana monodonta* Conrad, Pr. Ac. N. Sci., Phila. VI, p 262.

1912a—*Cumberlandia monodonta* Ortmann, Nautilus XXVI, pp 13 and 14.

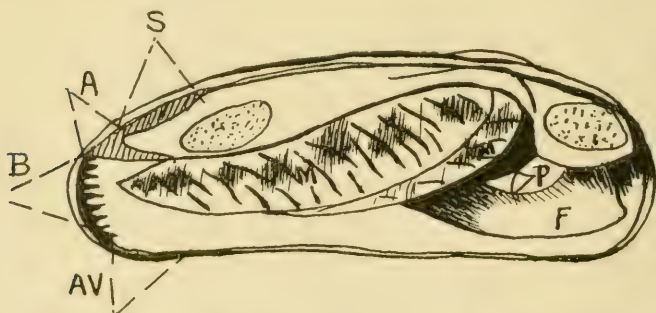


FIG. 1.—*Cumberlandia monodonta* (Say). ♀ Diagram of sterile individual from the Osage River, Sagrada, Mo., showing animal characters in left valve. (Nat. size.)

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with papillae reduced to mere crenulations; no gill partition (diaphragm) between branchial and anal openings; no true supra-anal opening; gills very long and narrow with interlaminar connections regularly arranged as "continuous septa which run obliquely forwards;" inner lamina of inner gill free from visceral mass except at its

anterior end; outer lamina of outer gill slightly free posteriorly from mantle, all four gills marsupial; palpi, large, comparatively broad, hangs low, united two-thirds of way toward base; color of soft parts soiled white, mantle edge blackish chiefly at the branchial openings.

REPRODUCTIVE STRUCTURES:—No gravid females found so far.¹ The gills of several specimens from the Mississippi River presented no variations of structure; hence this peculiar oblique arrangement of septa may not be a sex distinction.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Elongate-elliptical, arcuate in old specimens, not sexually dimorphic; rounded before, usually more pointed behind; beaks small, low, sculptured by a few coarse concentric bars; lines of growth rough, coarse; epidermis black, shell moderately thick anteriorly, but very thin posteriorly, being disposed to crack easily upon exposure to air.

INTERNAL STRUCTURES:—Cardinals conical, single in both valves, rudimentary to lacking in left; laterals low, single in right, inclined to double posteriorly in left; scars well impressed anteriorly—especially the one taking the position of anterior cardinals in most other *Naiad* shells; beak cavities shallow; nacre bluish with a slight tint of salmon in umbonal cavity; no vein marking as in most *Unioninae*.

♀	115	x	44.5	x	25mm	(Osage R., Bagnell, Mo.)
♂	127	x	45	x	27.5mm	(" " Sagrada, Mo.)
♀	122	x	47	x	26mm	(Miss. R., Louisiana, Mo.)
♂	96	x	40	x	20.5mm	(Miss. R., Louisiana, Mo.)

MISCELLANEOUS REMARKS:—*C. monodonta* is most typical in the Mississippi above the mouth of the Missouri. Bryant Walker records it from Tennessee to Ohio, thence Northwestward to Nebraska. From the fact that the author found this primitive species at several points in the Osage and Gasconade Rivers, its known distribution is now carried farther south and west of the Mississippi River, than recorded before. The existence of this, as well as other primitive forms of the *Naiades*, also in the Cumberland-

¹ Dr. A. D. Howard, (Scientific Assistant, U. S. Biological Station, Fairport, Iowa), has however recently discovered that this species bears unusually small glochidia and has the peculiar habit of bearing two broods in a season (Nautilus, XXIX, p. 6, May, 1915.)

Tennessee basin may furnish some interesting data for the reconstruction of ancient geographical features for the central Mississippi Valley.

FAMILY II. **Unionidae** Swainson (restricted).

"Diaphragm complete, formed only by the gills; the outer lamina of the outer gills connected with the mantle at its posterior end. Anterior end of inner gills separated from palpi by a more or less wide gap. Margins of the mantle held together by the gill-diaphragm, but not united, thus separating the anal from the branchial opening, and the anal is generally closed above by the union of the margins of the mantle, (it rarely remains open), and when closed, it always leaves a supra-anal opening (which is very rarely obliterated). Gills always with water tubes formed by interlamellar connections developed as continuous septa, running parallel to the gill-filaments. Marsupium formed by all four gills, or by the outer gills alone, or by parts of the outer gills. Glochidia of various shapes, suboval, or subtriangular, or celt-shaped, with or without hooks on the ventral margin."—(Ortmann 1912b.)

Simpson's terse diagnosis of this family is:—"Hinge with schizodont teeth; embryo a glochidium."

The family, *Unionidae*, naturally falls, into three divisions on the basis of physiological and morphological characters; however, this family may fall into two sub-divisions on the sole basis of reproductive functions. The *Unioninae* and *Anodontinae* would form the first and the *Lampsilinae* the second group from the fact that the discharge of the glochidia takes place in the former through the primitive and natural way of passage from the ovisacs through natural openings into the suprabranchial canals and then on out through the anal opening and in the latter the discharge is effected in a more direct and seemingly unnatural manner; that is, in the passage from openings forced through the ventral edges of the ovisacs, and thence out through the branchial opening. Yet the two sub-families, *Unioninae* and *Anadontinae*, have morphological differences in marsupial characters and in structures of the glochidial masses that are correlated with physiological differentiation in breeding habits. On the same grounds, *Lampsilinae* is set aside as well a defined group; however the latter, although the modern group, is related to the primitive one *Unioni-*

nae, in that the morphology of the Lampsiline glochidium would indicate a reversion to the primitive type as is the natural course in the cycle of evolution. Thus on the basis of glochidial characters, the Family Unionidae may be grouped as:

1. ANODONTA, bearing non-conglutinated glochidia, spadiform, spined.
2. PROPTERA, bearing conglutinated glochidia, celtiform, spined or spineless.
3. UNIO-LAMPSILIS, bearing conglutinated glochidia, apron-form, spineless.

The key to the whole situation governing the approach to the modern arrangement is in the differentiation of structures for the benefit of the embryos; e. g., large palpi for the *Unioninae*, marsupial water tubes (secondary) and also large palpi for *Anodontinae*, but, best of all, an adjustment of marsupium near to a specialized mantle edge in form of flaps, papillae, tentacles, etc., as shown in *Lampsilinae*.

I—SUB-FAMILY *Unioninae* Ortmann.

1911a—*Unioninae* Ortmann. An. Car. Mus., IV, pp. 335–336; 1912b An. Car. Mus. VIII, pp. 236–277.

ANIMAL CHARACTERS:—Branchial opening rather sparingly papillose; anal smooth to finely crenulate; supra-anal usually present separated from anal by very short or moderately long mantle connection; no tendency to form tubular siphonal openings; inner laminae of inner gills free from visceral mass; palpi usually very large and long, marsupium occupying all four gills or by the two outer ones, when gravid not much swollen, ventral edge pointed, never bluntly distended and secondary water-tubes never developed lateral to the ovisacs within; mantle edge antero-ventrad to branchial opening, smooth; glochidia of the *Lampsilis* type, apron-shaped, small to medium, semicircular or semielliptical, ventral margin rounded, without spines; conglutinates well formed.

SHELL CHARACTERS:—Forms of shell various, usually thick; disk smooth to very profusely sculptured; beaks usually sculptured with concentric or zigzag ridges; hinge teeth very highly developed, cardinals and laterals never lacking; scars well impressed.

MISCELLANEOUS REMARKS:—The soft anatomy of the species of this subfamily are rather constant. However, its shell characters

are so inconstant that this subfamily may be termed a great group of intergrades. Having very typical hinge teeth and very closely adhering valves the branchial margins are not well papillosed and the soft parts of the different species are more or less identical. In contrast with the other more modern subfamilies, *Anodontinac* and *Lampsilinac*, a greater differentiation of soft parts is noted in the latter, due to their more gaping valves and to a greater adjustment to aeration of the embryos; then, too, *Unioninac* differs from either of the two in that its breeding season is short (tachytictic), being confined to the summer. In the *Unionac* the color, form and solidity of the conglutinates can be considered as of greater systematic value than in the other sub-groups. It is to be noted that these summer breeders have the peculiar trait of aborting their conglutinates when they may be disturbed from their natural beds. The fact of the close, or even deciduous, mantle connection between the anal and the supra-anal openings may be a minor character in distinguishing the genera. The connection between inner laminae of the inner gills and the visceral mass may also serve in making distinction. From the fact that there are a great number of variations in shell character for this sub-family it is necessary to admit several genera so that there may not be so much opportunity for the same types of shell to turn up and thus give false impressions of relationships. It is very striking to note the atavism of the spineless, subovate glochidium of this sub-family in the fact of its homologous recurrence under the *Lampsilis* type. However, this natural reversion to primitive type in the embryo of the *Lampsilinac* is only an indication of the wide gap between the two sub-families as well as in the fact of its differences of physiological characters in the adult, such as the discharge of glochidia through the anal opening for the *Unioninac* and through the branchial for the *Lampsilinac*. However the homologous differences in the soft parts and hard parts of the two groups are still greater than the analogous. Why more species of this primitive group should occur in the more modern region of this state (i. e., N. Mo., the New Prairies) than in that of the more ancient geologic formation (i. e., S. Mo.,—the Ozark Uplift)—this is a problem that the author is trying to solve. The unusual variations within the sub-family especially is another problem that would also be solved.

Genus *Fusconaia* Simpson.

1900b—*Fusconaia* Simpson, Pr. U. S. Nat. Mus. XXII, p. 784 (as sect.)

1912b—*Fusconaia* (Simpson) Ortmann, An. Car., Mus., VIII, pp. 240-241.

(Type *Unio undatus* Barnes).

ANIMAL CHARACTERS:—Branchial opening with dense yellowish tentacles; anal smooth; supra-anal separated from anal by very short connection, laminae of inner gills free from visceral mass; palpi rather large; all four gills marsupial, ovisacs when gravid subcylindrical; conglutinates same shape, usually reddish, subsolid and discharged whole; glochidium subovate, somewhat small, spineless; colors of soft parts usually brilliant, such as orange or red.

SHELL CHARACTERS:—Shell roundly quadrate or triangular; disk smooth; beaks elevated, sculptured with concentric ridges angled at base of prominent post-umbonal ridge; epidermis reddish to brown with fine, rather interrupted, rays when young; hinge teeth well developed; beak cavities deep; nacre white.

MISCELLANEOUS REMARKS:—Dr. Ortmann considers this genus the most primitive of the *Unionidae* and limits it to those species of Simpson's *trigona* group that possess subcylindrical conglutinates and ovisacs, concentric beak sculpture and smooth disk as the diagnostic features. While the conglutinates of the *Fusconaia* species may be reddish, yet they may vary from pale pink to white due to their development usually. It is to be noted, however, that when the conglutinates are white all of the anatomy is also white; when the conglutinates are reddish the soft parts will be more yellowish. In this state the following groups may differ morphologically and ecologically as follows:

1. *F. undata*: swollen, high beaks, mostly greenish—black epidermis.....Big Rivers
2. *F. trigona*: swollen, lower beaks, mostly reddish epidermis.....Medium Rivers
3. *F. flava*: flat, low beaks, always reddish epidermis
Small Rivers

The second group is not found in very typical form in this State, but is represented by intergrading forms. In fact none of these Species, representing the above names, are very often found typical in Missouri, since this State seems to be the home mostly

for intermediate forms not only for *Fusconaia*, but for other Genera of this Sub-family, *Unioninae*, especially. All *Fusconaia* of this State are strictly fluviatile. For the most part the Species of this Genus are *hermaphroditic*, for all localities.

***Fusconaia undata* (Barnes).**

("Pigtoe.")

Pl. xv. Figs. 29 A and B.

1823—*Unio undatus* Barnes, Am. Jour. Sci., VI, p. 121, pl., 1V, fig. 4.

1831—*Unio trigonus* Lea, Tr. Am. Phil. Soc., IV, p. 110, pl XVI, fig. 40.

1900b—*Quadrula trigona*, Simpson, Proc. U. S. Nat. Mus., XXII, p., 787.

1900—*Quadrula undata* Walker, Nautilus, XXIV, pp. 5-11 and 16-24, Plates I and I.

1912b—*Fusconia undata* (Barnes) Ortmann An. Car. Mus., VIII, p. 241.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES—Branchial opening with short brownish papillae; anal slightly papillose, separated from supra-anal by very short,—even deciduous—mantle connection; inner gills larger, inner laminae free from visceral mass; outer gill undulate antero-ventrad, palpi moderately large, connected over half of their length antero-dorsad; most of soft parts yellowish or cream colored.

REPRODUCTIVE STRUCTURES:—Marsupia formed by all four gills, when charged not distended, lumen of ovisacs subcylindrical; conglutinates same form, light red—even to white—according to age of embryos; glochidium semicircular, medium size, hinge line nearly straight, length and height (0.160 x 0.155mm), about same.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell trigonal, thick, heavy anteriorly, disk smooth; beaks high, full, pitched slightly beyond anterior end, sculptured with concentric ridges breaking into nodules at base of prominent umbonal ridge; dorsal line bowed, post-ventral line with long gentle incurve; broad shallow valley in front of post-umbonal ridge; ventral margin bowed in semicircular form; epidermis greenish to rusty brown or black or mingling of both green and black; rest lines furrowed giving an undulated effect; post-umbonal ridge prominent.

INTERNAL STRUCTURES:—Cardinals single and pyramidal in right, double and roughly socketed in left; laterals double in

both valves; scars deeply impressed; beak cavity narrowly deep; nacre silvery white; male shell usually more compressed than that of female, but no true dimorphism shown.

Length	Width	Diameter	Um. ra.	Locality.
75 x	63 x	48mm	0.16	(Miss. R., LaGrange, Mo.)
70 x	64 x	49mm	0.78	(" " " " ")
55 x	43 x	39mm	0.17	(Meramec R., Fern Glen. Mo.)
60 x	55 x	46mm	0.17	(Osage R., Linn Cr., Mo.)

Juvenile Shells are described as having a light yellowish brown epidermis with green rays most distinct on anterior slope, and finely ribbed lines running from beaks to ventral margin across center of disk.

MISCELLANEOUS REMARKS:—This species was hidden in synonymy for many years until Mr. Bryant Walker (1910b, p. 5) brought it to light through diligent study. It is found in most typical form in the Mississippi River and occasionally it may be found in the Meramec and Osage Rivers where it is to be distinguished from *F. flava* by its swollen high beaks and darker epidermis. Then, too, this species is determined largely ecologically, being an inhabitant of the large streams and deep water, for the most part. In most of the interior streams of the state, *undata*, however, is found chiefly in an intermediate, or intergraded, form with *flava*. In the whole southwest this species does not seem to be very near the type as found in the Ohio drainage or in the Upper Mississippi, especially in Wisconsin where Barnes secured his type lots. The Des Moines River, Clark Co., Mo., has produced rather good types, some shells of which have been sent to the National Museum by Mr. B. F. Bush and are now on exhibit there under the number 132, 633. However, none of these so-called *undata* types come up to those of the Upper Mississippi. Surber (1913, p. 113) finds *F. undata* in the larval state to be a gill parasite on the black crappie (*Pomoxis sparoides*) as an occasional host. *Undata* is a tachytictic form, but begins its breeding very early, bearing glochidia June, July and August and hence has an unusually long period for a summer breeder. The writer has observed that during the first part of the breeding season, when the ova are bright carmine color, that not only the marsupium but also the nutritive parts—especially the foot are also a brighter color—chiefly orange—than at the end of the season when most of the anatomy has a brownish or soiled white color.

Before maturity the glochidia have been observed to be yellowish brown and contained in pinkish sacs.

***Fusconaia undata trigona* (Lea).**

("Little Pigtoe.")

Pl. xv. Figs. 31 A and B.

1913a—*Fusconaia undata trigona* (Lea) Ortmann, Pr. Am. Phil. Soc.,
LII, No. 210.

ANIMAL CHARACTERS.

The nutritive and reproductive structures of this subspecies are, of course, identical with those of its species.

SHELL CHARACTERS.

Shell more quadrate than that of *F. flava*, post-umbonal ridge not so prominent, more solid anteriorly, higher fuller beaks, epidermis darker. Compared to its typical species it never matures to be as large, nor as heavy, is not quite so upright, nor as inflated, has lower beaks and more of a reddish epidermis. The internal shell structures are identical with those of its species. From the subspecies, *trigonoides*, it differs chiefly in being more upright, not so elongated, nor as large.

Length	Height	Diameter	Locality
65 x	53.5 x	41mm	(Osage, R., Sagrada, Mo.)
60 x	50. x	32mm	(" " Monegaw Springs, Mo.)
60 x	54 x	34mm	(" " Warsaw, Mo.)
48.5 x	40 x	26mm	(" " Linn Creek, Mo.)

MISCELLANEOUS REMARKS:—This sub-species is one of the decided intergrades for *F. undata* and *flava* and is the most common form in the interior streams of the state—especially in the Osage where the writer, in a 300 mile survey by boat, made a thorough study of them to find the interior of shell and soft parts to be identical with those of the species; however, none of these forms were found with reddish conglomerates, nor yellowish soft parts. Probably this whitish colorization was due to the advanced stage of gravidity in which they happened to be found when they were encountered between the upper and lower stretches of the river. at the latter part of July. This variety of *undata* may be ecologically determined as a dweller in medium sized rivers, or, if found in a large river, in medium stream conditions. This is found to be the case in the Osage, for the more the mouth is approached the more this form is supplanted by the heavier, more inflated

and more typical shell of the main species. This subspecies, however, is more like the type than the *trigonoides* of Frierson, the latter being more nearly the *flava* type and hence might be well named "*F. undata flava* (Raf.)"

***Fusconaia undata trigonoides* Frierson, MS.**

("Big Pigtoe.")

Pl. XV—Figs. 30 A—D; Pl. IV, Figs. 9a, and 9b.

1913—*Fusconaia undata trigonoides* Frierson MS.—Personal Letter, February 22, 1913.

ANIMAL CHARACTER:—Soft parts indential with species. Glochidium measures 0.180 x 0.165mm; conglutinates white in glochidial and late embryonic stages, pink in earlier stages.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elongate trigonal, thick, heavy, very large for the genus; disk without sculpturing except that rest-lines are somewhat furrowed giving an undulate appearance to growth lines; beaks comparatively low and not placed so much anteriorly, sculptured with concentric bars breaking into two or three nodules at base of post-umbonal ridge; post-dorsal part of shell, bowed, slightly biangulated behind; epidermis cloth-like, reddish brown to horse bay color, rayed in young.

INTERNAL STRUCTURES:—Identical with those of the species and other intergrading forms, except that it may vary from a white to pink nacre.

Length	Width	Diameter	Location
93	x 66	x 42	(Platte R., Dixon Falls, Mo.)
70	x 50	x 38	(Osage R., Schell City, Mo.)
50	x 40	x 24	(Osage R., Warsaw, Mo.)
28	x 20	x 14	(Platte R., Garrettsburg, Mo.)

The juvenile indicated by the measurement under the last number was found lying on its side in the shallow water of a riffle. It is different from the mature shell in its dark yellow epidermis marked all over by green rays, also by more prominent umbonal ridge, more centrally placed and more distinctly sculptured beaks. The soft parts are all of a bright orange color except the bluish visceral mass.

This specimen and also the one under the first measurement of the above list were kindly indentified by Dr. Ortmann as *F.*

undata rubiginosa (Lea) a name which this form might well bear because of its closer relation with *F. flava* (Raf.) [= *F. rubiginosa* (Lea)]. After a prolonged correspondence among Messrs. Simpson, Walker and Frierson this rather common and peculiar form was left to the latter for naming; hence the MS. name herein given.

MISCELLANEOUS REMARKS:—This intergrade is very near the form, *undata-trigona*, and differs only in being more elongated, less upright, more rounded, post-dorsal margin, more reddish epidermis, lower beaks, and is a larger, heavier shell. Those of this variety that are found in the Mo. Platte of North Mo. have the most ponderous shell of any of the *Fusconaia*—some reaching a length of 100mm while the average length of the species (*F. undata*) for the Mississippi only average 60mm. This variety seems to be more of a creek form of *F. flava* and the reason for this form being larger in the Platte R., a smaller stream, than in the Osage, the largest tributary of the Missouri in this State, may be traced as a mere local effect since the shells of other species in the Mo. Platte are found to be abnormally large. Like most of the *Unioninae* this form has a peculiar habit of aborting its conglomerates when taken from its natural bed. The author has been able to pick out for study the little pink club-shaped conglomerates from whole masses of other white leaf-shaped conglomerates of *Quadrulae* or *Pleurobema* that would also be aborted after being collected from the river and placed in a tub or aquarium. The habits of this form are that of deep and rapid burrowers and inhabitants of deep water and coarse gravelly bottom. It is found to be gravid from May until September and sterile for the rest of the year. A proposed publication by Mr. Frierson on these puzzling southwestern forms of *Fusconaia* will, without doubt, clear up the situation.

***Fusconaia flava* (Rafinesque.)**

(Pigtoe," "Red Shell," "Red Nose," "Wabash Pigtoe.")

Pl. XV. Figs. 32 A—D.

1820—*Unio flavus* Rafinesque, Monog. Bio. Shells of R. Ohio.

1829—*Unio rubiginosa* Lea, Tr. Am. Phil. Soc., III, p. 427. Pl. VIII, fig. 10.

1898—*Quadrula rubiginosa* Baker, Moll. Chicago. Pt. I. p. 77, Pl. XIX, fig. 1; XX, fig. 1.

1912—*Fusconaia rubiginosa* Ortmann, An. Car. Mus., VIII, pp. 241 242, Text Fig. 4.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with papillae on inner edge, anal with fine but distinct papillae; supra-anal long and large with very short connection of mantle edge; gills sharply pointed behind with wide space between the anterior attachment to mantle and base of the palpi, inner laminae of the inner gills entirely free from visceral mass; palpi rather large, subfalcate; color of soft parts variable, but usually orange yellow especially the distal end of foot, also mantle edge and adductors, while sterile gills are brownish.

REPRODUCTIVE STRUCTURES:—Marsupia with crowded septa dividing the ovisacs parallel to the gill filaments; when charged, lumen of ovisacs somewhat cylindrical containing club-shaped conglomerates which are carmine red or pinkish to whitish in color; glochidia somewhat small, semicircular, spineless, hinge line nearly straight, about as long as high (0.150 x 0.155mm).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell trigonal-quadrate, rather thick, compressed, rather rounded post-dorsad, gently curved ventrad; disk somewhat undulated by growth lines; beaks not very high or full, sculptured by concentric ridges breaking into 2 or 3 nodules at base of posterior ridge; this post-umbonal ridge usually flattened; epidermis yellowish to dark horn color, rayed in well preserved and young shells, eradiate in old.

INTERNAL STRUCTURES:—Cardinals double in both valves; laterals long, serrated; scars well impressed; beak cavity narrowly deep; nacre mostly white, sometimes tinged with salmon in beak and antero-branchial cavities, iridescent.

Length	Width	Diameter	Locality.
65 x	45 x	30mm	(St. Francis River, Greenville, Mo.)
43 x	35 x	25mm	(" " " " ")
50 x	40 x	24mm	(White River, Hollister, Mo.)
34 x	27 x	16mm	(" " " ")

This latter measurement is that of a somewhat advanced adolescent shell. However, it shows the juvenile characters of a flattened post-umbonal ridge, a rounded post-dorsal line and the very distinct concentric sculpturing on the beaks much more evidently than in the adult. The most striking characters, that are absent in the mature shell, are the green rays.

MISCELLANEOUS REMARKS:—This species is distinguished mostly from *F. undata* and the intergrades by its more quadrate and compressed form of shell, by lower beaks, and less upright position. *F. undata trigonoides* is separated from it by possessing a heavier and more elongated shell with a more prominent post-umbonal ridge and black epidermis. The White River shells, indicated in the above measurements, are rather intergrades for this species and *hebetata* and the St. Francis *flava* are too inflated to be very typical. Since this State proves to be such grounds for the inconstant occurrence of types, and this species is so susceptible to intergradation, it is difficult to find a typical *flava*, such as found in the Interior Basin east of the Mississippi. Perhaps its nearest form is in drainage for the south slope of the Ozarks in this state, although Simpson reports it as having a general distribution throughout the Mississippi drainage. This distribution doubtless included its many forms. Simpson further states that the St. Lawrence River system includes *flava*. Dr. Sterki (1898, p. 30) considers this species as occasionally *hermaphroditic* by examination of its gonads. Surely *this finding can be confirmed by the forms of Missouri*, for it is rarely that it is even locally a *gonochorist*. *Flava* is typically *tachytictic* being only found gravid from May until August.

Fusconaia hebetata (Conrad).

Pl. XV,—Figs. 33A and B.

1854—*Unio hebetatus* Conrad., Jl. Ac. N. Sci. Phila. II, p. 296, Pl. XXVI, Fig. 5; 1888—B. H. Wright, Check List.

1900b—*Quadrula hebetata* Simpson, Proc. U. S. Nat. Mus., XXII, p. 787.

ANIMAL CHARACTERS:—The soft parts of a form of *F. hebetata*, found in the Osage River, were discovered to be identical with those of *F. flava*.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell rather orbiculate-quadrate, thick, moderately inflated, post-umbonal ridge prominent, disk smooth, beaks flat, and well back from the anterior end post-dorsal ridge rounded, post-ventral margin gently undulate; epidermis black with a few faint imbricated rays toward (but not across) the disk in the middle of the umbonal region.

INTERNAL STRUCTURES:—Cardinals single in right, double

in left, interdentum deeply gashed in right; laterals double in left with slight tendency to double in right; umbonal cavity narrowly deep, scars deep; nacre white to pale pink.

Length Height Diameter

Locality.

58 x 50 x 26mm (Osage River, Linn Creek, Mo.)

MISCELLANEOUS REMARKS:—The above measurement is that of a moderately compressed shell resembling that of some typical *hebetata* shells which are sent to the writer from Alabama and considered as types by Messrs. Wright, Walker and Simpson. The latter student (1900b, p. 787) reports the Alabama *hebetata* as also found here in Missouri, but no specific locality is given. Since there seems to be so much confusion concerning this shell of Conrad with his own *cerina* or with Lea's *rubida* it should be investigated. Probably it would be found (through longer suites of shells) that the broad compressed *flava* of the White River would either be a form of Conrad's *hebetata* or an unusual *flava* of Rafinesque, or perhaps an age-form of the latter. As matters now stand this species (if it be a good one anywhere) must be listed with some doubt for Missouri.

Fusconaia ebena (Lea).

("Nigger Head.")

1831—*Unio ebena* Lea, Trans. Am. Phil. Soc., V. p. 84, pl. IX, fig. 14.

1900b—*Quadrula ebenus*, Simpson, Proc. U. S. Nat. Mus., XXII, p. 793.

1912b—*Fusconaia ebena* (Lea) Ortmann, An. Car. Mus., VIII, p. 245.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with branched papillae; anal smooth or crenulated; supra-anal large briefly connected to anal by mantle edge; gills brown outer pointed anteriorly inner laminae of inner gills free from visceral mass; palpi moderately large and connected about half of their length antero-dorsad.

REPRODUCTIVE STRUCTURES:—All four gills marsupial; when charged scarlet, not distended; before gravidity ovaries carmine color; glochidium semicircular, spineless, medium size, hinge line straight but slightly oblique, length and height about equal (0.160 x 0.15 mm), conglomerates subcylindrical, bright pink.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell thick, solid, subrotund, some-

times shows a tendency to bianguation posteriorly; beaks incurved, projecting forward, sculptured with concentric lines but no sculpturing carried out on the disk; rest lines of growth concentric and furrowed; epidermis satiny horn color.

INTERNAL STRUCTURES:—Cardinals large and massive; laterals long and heavy; interdentum broad; beak cavities deeply creviced; scars deep; nacre pure white, stippled, iridescent.

Sex	Length	Height	Diameter	Um. ra.	Locality.
♂	105	x 75	x 60mm	0.090	(Miss. R., La Grange, Mo.)
♀	95	x 65	x 57mm	0.100	(" " " " ")
♂	56	x 46	x 32mm	0.120	(" " Hannibal, Mo.)
♂	20	x 18	x 8mm	0.115	(" " " " ")

The shell of the juvenile of this last measurment is so round, and with beaks so drawn up to center of dorsal line that it resembles that of a *Sphaerium*. Umbonal sculpturing not very distinct even in this juvenile. It can always be identified in the early stages of its juvenility by white spots located post-dorsad on its shell.

MISCELLANEOUS REMARKS:—The writer, after some years of extensive collecting from the largest streams of the state, has failed to find *ebena* in the interior streams, neither have any Missouri collectors, nor old "clammers" reported it. This shell is known not only for its greatest commercial value and for its rarity in general geographical distribution but also for its great abundance locally. Of course its only home, known so far, is the Mississippi north of the Missouri River. It is not known why this species does not occur for this state in those Ozark rivers that bear it in great abundance in Arkansas not far from the Missouri-Arkansas line. Sometimes a black shelled *Pleurobema pyramidatum* or *Fusconaia undata trigonoides* may be taken for the "Nigger Head" (*F. ebena*), but, from the characteristic cornucopia-form of shell, together with its deep brown satiny epidermis and regular, concentric furrowed rest lines of growth, it should be easily identified. Frierson reports *ebena* as a rare shell in Louisiana and Isely (1914, pp. 1-4) does not report it at all for the Arkansas and Red River drainages of eastern Oklahoma. Perhaps Call's account of it (1895, p. 16) as a common shell, not only for Arkansas, but for all the larger rivers west of the Mississippi, is more conjectured than real. Its breeding season has been found by Wilson and Clark (1914, p. 42) to extend from May to the middle of July. Surber

(1913, p. 104) finds the host that is the specific distributor of this valuable shell to be a fish known as "skipjack" (*Pomolobus chrysochloris*).

Genus *Amblema* Rafinesque.

1820—*Amblema* Rafinesque, Monograph Biv. Shells of R. Ohio.

1912b—*Crenodonta* (Schluter) Ortmann, An. Car. Mus., VIII, pp. 245-250.

(Type *Unio plicata* [Lesneur] Say).

ANIMAL CHARACTERS:—Branchial opening long with few small arboreal papillae; anal large, very slightly crenulated; supra-anal separated from anal by very short mantle connection, sometimes no connection at all; gills large, inner wider and longer, outer connected high up to mantle antero-ventrad, inner laminae of inner gills free from visceral mass; palpi long, falcate united most of their length antero-dorsad; marsupia occupy all four gills, ovisacs of inner being wider, when gravid ovisacs expand transversely; conglutinates white, compressed, leaf-like shape, discharged through anal passage in rather broken or loose masses; glochidia small, spineless, subovate.

SHELL CHARACTERS:—Shell subquadrate to subtrapezoidal, thick, beaks more or less elevated, sculptured with concentric lines slightly angled at the base of the post-umbonal ridge and disappearing out upon the disk or continued there in a zigzag pattern of irregular broken pustules, nodules and oblique, indulated or plicated folds, the latter being disposed across the posterior half; hinge teeth heavy and well developed; beak cavities deep crevices under rather wide interdentum; vein markings on antero-pallial margin distinct; nacre usually white.

MISCELLANEOUS REMARKS:—It is recognized by students of *Naiades* that this genus needs a thorough revision—especially as to its shell characters. Like the genus *Fusconaia*, *Amblema* is a group of all sorts of inter-grading and puzzling forms. However, for this State it is not so much a question of facts regarding a predominance of these plicated forms for the different faunae as it is an application of these varieties to the present chaotic nomenclature for this genus. As nearly as the writer is able to determine, after a correspondence with students and a thorough study of literature and actual field conditions, the present status of affairs would group the species and other allied forms of *Amblema*

for North Missouri under the so-called *plicata* (Say) types, for the most part; those of Central Missouri under both types of *plicata* and the better known *undulata* (Barnes), and those of Southern Missouri under *undulata*. These facts might be accounted for by the natural physiological adjustment to ecological conditions—that is to say, the quiet, sluggish, muddy streams of North Missouri tend to produce a heavy, inflated, rarely plicated shell, mostly represented by *Amb. rariplicata* of Deshayes; on the other hand, the swift, clear water streams of South Missouri have the tendency to shape up a compressed and multi-plicated shell best represented by *Amb. perplicata quintardi* of Cragin, while the intermediate or combined ecological conditions of Central Missouri give combinations of these two extremes. In the grouping of the members of this genus there has been much necessary elimination of local varieties and races and thus types have been adhered to as much as possible. The arrangement is only submitted as tentative due to the doubt of the present nomenclatural situation. This problem may be easily solved if it may be found that the morphology of shell characters may be traced, in most instances, to ecology. Probably this solution may be accomplished by studies of closely connected series from the glochidial to the mature shell. Our judgment, from studies of local conditions in this state, would be that the obliquely undulated and plicated folds, forming the chief shell character of this genus, are more developed in swifter current as a physical adaptation for survival by the way of more permanent anchorage, etc., just as we may account for the pustulate and nodulous characters of the shell instead of considering them as mere characteristic markings. However, when it has been found that the *beak sculpture* (the most constant shell character) of *Amb. plicata* (Say) and *costata* (Raf) [= *undulatus* (Barnes)] are really different and that there has been a differentiation from the adolescent shells to the mature ones we are compelled to recognize genetic distinctions in these two species. Yet it seems that it may be safely stated that two such well defined groups are connected in all manner of inter-grades through environmental causes such as seen in the different ecological provinces of Missouri. It is found that this genus has a short period breeding season, that the white, leaf-shaped conglutinates are discharged by the natural outlet of the anal opening and that these are delivered in broken, loose masses just as soon as the larvae are mature, or even ejected

before maturity ("aborted") if disturbed. According to recent studies of Dr. Ortmann and Mr. Frierson *Amblesma Rafinesque* should supplant all previous names for this genus because *Amb. costata* Raf. is without doubt *Unio undulatus* Barnes; hence the following nomenclature:

(1)—*Amblesma plicata* (Say) 1817 = *U. plicatus* Say. = *U. hippopea* Lea = *Quadrula plicata hippopaea* Simpson.

(2)—*Amblesma plicata costata* (Raf) 1820 = *U. undulatus* Barnes 1823 = *Quadrula undulata* Simpson.

(3)—*Amblesma peruviana* (Lamarck) 1819 = *Quadrula plicata* Simpson.

Note that because of the Law of Priority the local form (*plicata* Say) from Lake Erie must be considered unfortunately as the main species, although other than taxonomic reasons would not justify the recognition.

Amblesma peruviana (Lamarck)

("Three Ridge," "Big Blue Point").

Pl. XVI,—Figs 35A and B.

1819—*Unio peruviana* Lamarck, An. Sans. Vert., VI, p. 71., Deshayes, An. Sans. Vert., 2d ed., VI, 1835, p. 533; 3d. ed., II, 1839, p. 667.

1900b—*Quadrula plicata* (Say) Simpson, Pr. U. S. Nat. Mus., XII, p. 767.

ANIMAL CHARACTERS:—Since this species is simply an *Amb. rariplacata* (Des.) with very full, high beaks and with identical soft parts, except a small difference of form due to a more elongated shell with deeper umbonal cavities, we would refer our readers to the description of these characters for *rariplacata*. Gravid marsupia have the same structure. Glochidia of *peruviana* are found to be semicircular, spineless, medium size, about as long as high (0.200 x 0.210 mm.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elongate-quadrate with ventral edge rather straight, post-dorsal portion bowed, heavy and greatly inflated anteriorly, rather compressed posteriorly; beaks high, full, incurved, well placed forward, sculpture consisting of concentric lines forming two loops at base of post-umbonal ridge; undulations four to five, coarse, oblique from ventral margin to umbonal region across post-umbonal ridge; costae on slopes

of post-dorsal ridge few, broad, shallow and faint; epidermis leathery red to black, rarely yellowish or greenish.

INTERNAL STRUCTURES:—Cardinals double in both valves; laterals single in right, double in left valve; umbonal cavities narrowly deep; muscle scars well impressed; nacre marble white with blue and old rose tints posteriorly; deep vein mark on antero-extra pallial border.

Sex	Length	Height	Diameter	Localities.
♂	101	x 64	x 54 mm	(Mississippi R., La Grange, Mo.)
♀	112	x 74	x 46 "	(Osage R., Monegaw Springs, Mo.)
♀	48	x 40	x 29 "	(Mississippi R., Hannibal, Mo.)
♂	33	x 28	x 20 "	(Osage R., Osceola, Mo.)

Juveniles of latter measurement very globose; epidermis olivaceous with a reddish brown band in center parallel to growth lines; post umbonal ridge rather prominent; one heavy undulation at post base with two heavy furrows on either side. The very greatly inflated beaks of adult shell is doubtless due to the globular shell of the juveniles.

MISCELLANEOUS REMARKS:—*Amblema peruviana* (Lam) is the *Quadrula plicata* (Say) of authors according to the recent decision of Mr. Bryant Walker who is making a special study of original Lamarckian types. Mr. Walker states that Say's type of *plicata* came from Lake Erie and is the form that Lea describes as *hippopaea* and that *peruviana* is a form of the Ohio shell commonly called *plicata* but which is really the *rariplicata* Deshayes. This species should perhaps be reduced to the subspecies, "*Amb. rariplicata peruviana* (Lam); however, because of its difference from *rariplicata* in the possession of full beak and more globular juvenile shell it is left in specific rank. It is found in typical form in the Mississippi north of the Missouri, is scarce but rather typical in the Osage, but is not found at all in the interior north of the Missouri, River.

Amblema rariplicata (Deshayes)

("Ohio Plicata," "Few Ridge," "Big Blue Point.")

Pl. IX,—Fig. 20; Pl. XVI,—Figs. 36A-D.

1830—*Unio rariplicata* Deshayes, Enc. Meth; II, p. 578; An. Sans. Vert., 2d. ed., VI, 1835, p. 533; 3d. ed., II, 1839, p. 667.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening very long with short yellowish papillae; anal slightly crenulate; supra-anal very

closely—even decidedly—connected to anal by mantle connection; inner gills longer and wider—much wider anteriorly, inner laminae free from the visceral mass; palpi large, connected for about one-third of their length antero-dorsad; except for its brownish gills and palpi the soft parts are a soiled white color.

REPRODUCTIVE STRUCTURES:—All four gills marsupial, ovisacs of inner marsupia more extended transversely, giving the white conglomerates a leaf-shape; ventral edges pointed; glochidia medium size, semi-circular, hinge line long and nearly straight, as long as high, 0.210 mm; conglomerates lanceolate, leaf-like, discharged in broken masses, white in color.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subquadrate, thick, inflated, posterior end rather rounded; beaks flattened, sculptured concentrically with two or three nodulous structures at base of flattened post-umbonal ridge but disappearing upon the disk; disk with but few shallow undulations, sometimes entirely smooth and running obliquely to position of post umbonal ridge; slopes of post-dorsal ridge rarely costated; epidermis brown or very dark horn color.

INTERNAL STRUCTURES:—Cardinals massive, scars deep, umbonal cavity deeply creviced; nacre white with blue, iridescent posterior surface.

Sex	Length	Height	Diameter	Locality.
♂	120	x	72	x 52 mm—0.169 (Platte R., Dixon Falls,)
♀	130	x	80	x 62 " —0.230 (" " Garrettsburg,)
♀	115	x	80	x 51 " —0.215 (Tarkio R., Craig,)
♂	22	x	20	x 14 " —0.220 (Platte R., Agency Ford,)

Juvenile shell indicated under last measurement is orbicular in outline, has medium inflation and comparatively high beaks; however, it does not possess the globose character of *peruviana* and its full beaks are soon lost the older it becomes as determined by a good suite.

MISCELLANEOUS REMARKS:—*Amb. variplicata*, as already explained, is the Ohio shell many authors refer to as the *plicatus* of Say, or even as the *perplicatus* of Conrad. It is to be distinguished from the former since that is the Lake Erie form with full beaks; from the latter, however, *variplicata* is not so easy to distinguish, as its beaks are similar, yet it differs from *perplicata* in being more inflated, with less and shallower plications and with

no tendency toward posterior biangulation. *Perplicata*, being more of a southern form, is not found in this state north of the Missouri, while *raripllicata*, a more northern shell, is mostly confined to North Mo., where it is the predominant species of the *Amblemac*, yet it is found occasionally in Central Missouri. Mr. Bryant Walker, who has rescued *raripllicata* from the synonymy of Simpson's *Quadrula plicata*, has recognized the North Missouri "*plicata*" as Deshayes' shell. The habitat of this species is that of muddy bottom with a substratum of limestone, of deep and quiet water and prefers muddy rivers to that of clear creeks. It is found in the Mo. Platte, Grand R., Big Tarkio and occasionally in their larger tributaries. It has never been found in any of the lakes. Its breeding season is very short, having been found gravid only in June.

***Amblema perplicata* (Conrad)**

("Blue-Point," "Three-Ridge," "Round-Lake.")

Pl. XVI. Figs. 37 A and B.

1841—*Unio perplicatus* Conrad, Pr. Ac. N. Sci., Phila., I, p. 19.

1900—*Quadrula perplicata* Simpson, Proc. U. S. Nat. Mus., XXII, p. 767.

1912b—*Credononta perplicata* Ortmann, An. Car. Mus., VIII, p. 247-248.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell ovate, or obliquely, quadrate, medium in size, moderately inflated, greatest inflation at center of disk; beaks low concentrically sculptured with two or three loops at foot of post-umbonal ridge; posterior end of shell biangulated, 5-6 coarse plications across post-half of shell parallel to antero-postero axis; costae on rounded, post-dorsal ridge few, broad; epidermis black.

INTERNAL STRUCTURES:—Cardinals double in both valves; interdentum long and broad; laterals single in right, double in left; muscle scars deeply impressed; naere white with posterior surface bluish to lavender, iridescent.

Sex	Length	Height	Diameter	Locality
♂	115	x	80 x 48mm	(Osage R., Osceola, Mo.,)
♀	90	x	66 x 46 "	(St. Francis R., Greenville, Mo.,)
♀	83	x	67 x 48 "	(Osage R., Linn Creek, Mo.,)
♂	16	x	14 x 10 "	(" " Warsaw, Mo.)

Many juveniles taken in the Osage average as the above

Warsaw specimen. They are rotund, inflated, epidermis greenish and approach the spherical form of the juvenile *peruviana*. Beaks, even in these young shells, are too eroded to make out the sculptural markings.

MISCELLANEOUS REMARKS:—Since *Amb. perplicata* is a Southern species it is only found in this state in typical form in the south drainage of the Ozark Uplift. Personal collections made by the writer from the St. Francis are found to compare well with typical *perplicata* shells received from Mr. Frierson and taken from type localities. This species is also sparingly found in the Osage where its subspecies, *quintardi* of Cragin is the predominant form of *Amblemac*, and from which it is distinguished by the smaller, more compressed, and much plicated shell of the latter. Under the description of *Amb. rariplicata* the distinguishing features between that species and *perplicata* have been mentioned. At first the inclination was to set this species down in the synonymy of *rariplicata* from general shell features, but the few specific differences in shell as well as that of geographic range are enough to make it distinct. This species is tachytictic, being found gravid by Wilson and Clark (1914, p. 42) from May until July inclusive. The writer examined many throughout June and July to find none gravid; however, its subspecies (*quintardi*) was found gravid during these months and because of these fact some reason was given that this smaller, compressed form was only the female of the larger one, just as seen in case of *Plagiola securis* or *Obovaria retusa*.

Amblema perplicata quintardi (Cragin)

("Little Blue-Point," "Multiply.")

Pl. XVI. Figs. 38 A—D.

1887—*Unio quintardii* Cragin, Bull. Wab. Coll., II, p. 6; Pilsbry, Pr. Ac. N. Sci. Phila., 1892, p. 131, pl. VII, figs. 1-3.

1891—*Unio pilsbryi* Marsh, Nautilus, V. pp. 1 and 2; Nautilus, VII, 1893, pl. I, figs. 7 and 8.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Similar to those of the species, having its anal and supra-anal openings often unconnected by mantle edges, free laminar edges of inner gills, palpi mostly connected by their edges, and being colored a dirty white or tan; reproductive structures also rather identical in possessing marsupia

occupying all four gills, swollen in the center, when gravid, white when filled with ova, rich brown when charged with glochidia; conglutinates leaf-like, not solid, easily broken; *glochidia semi-circular, medium in size, hinge line nearly straight, measuring 0.205 x 0.215 mm.* Dr. Surber kindly identifies:—"Like *plicata*, but slightly larger. Easily within the range of variation shown by this species from different localities."

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell obliquely quadrate, small, moderately compressed, rounded before, usually biangulated behind; slightly alated; posterior half of disk profusely plicated, some plicated folds devaricated behind; slopes of post-dorsal ridge with several upcurved costae; beaks low well placed anteriorly, sculptured in concentric fashion with strong ridges upcurved posteriorly; epidermis dark reddish brown to black, without rays.

INTERNAL STRUCTURES:—Cardinals compressed, obliquely grooved, double in both valves, laterals long, slightly curved; beak cavities rather deep; nacre dull white.

Sex	Length	Height	Diameter	Locality
♀	115	x 80	x 48mm	(Osage R., Proctor, Mo.)
♂	80	x 58	x 38 "	(White R., Hollister Mo.)
♀	16	x 9	x 5.5 "	(Osage R., Monegaw Springs, Mo.)
♂	5	x 4	x 3.5 "	(" " Taberville, Mo.)

These last two measurements are among the smallest juvenile shells obtained from the Osage where *quintardi* is so abundant. The writer has examined hundreds of them resulting in this general description:—Subovate, slightly longer than high, inflated (yet diameter never equal to height or length), rather bialated; beaks flat (dorsal line over umbonal region curved), sculptured quite well down on disk with three coarse irregular shaped ridges directed post-ventrad having comparatively deep valleys between these bars; epidermis brownish yellow; not byssiferous. Dr. Howard kindly comments: "These juvenile are of the *plicata* group of the Osage the exact relationships of which seems to be undecided."

MISCELLANEOUS REMARKS:—Surely this subspecies is a decided intergrade of the *perplicatus* Conrad and *costata* Rafinesque (= *U. undulatus* Barnes). Mr. Walker has referred this abundant shell for South and Central Missouri to *perplicata* variety *quintardi*

Cragin while Mr. Frierson would assign it to *undulata* variety *Pilsbry* Marsh; however, comparisons of these two forms seem to indicate that they are so identical as to assign the latter, through rules of priority, to the synonymy of the former. Dr. Ortmann, who has examined the anatomy as well as the shell characters of this confusing form, considers it as more like *Amblesma costata* (Raf.) and suggests the reason why the writer should only find this little "Blue Point" gravid during a six week's survey of the Osage River was that the larger *Amblesmae* were probably males of the same species although such sex dimorphism has not been observed in this genus before. Prof. Clark would also assign this form more to the *undulata* (Barnes) than to the *plicata* (Say) group. It has also been considered as very near *undulata* variety *latecostata* (Lea). Dr. Surber would not refer it to either group. One thing is certain, that it is not the typical *Amb. plicata costata* (Raf.) and is far from either *Amb. rariplacata* (Des.) or *peruviana* (Lam). Since there are few intergrades above or below *quintardi* and since it is also such an abundant shell for this state and Kansas it is hoped that its assignment here settles it fairly well in this genus. The identical form is common in the White, St. Francis, Black and other southern streams of the Ozarks as well as in the drainage basins of the Osage, Gasconade, Meramec and other streams of the north slope of the Ozark Uplift. However, this sub-species is not found in North Missouri. Hence its habitat is more that of the swift, clear-water streams. Its breeding season is found to be the same as that of its parent species.

***Amblesma (plicata) costata* (Rafinesque)**

("Wash-Board," "Three-Ridge," "Blue-Point.")

"Flat-Plicate," "Fluter.")

Pl. XVI, Figs. 39 A—D.

1820—*Amblesma costata* Rafinesque, Monograph of Biv. Moll. of R. Ohio.

1823—*Unio undulatus* Barnes, Am. Jour. Sci. and Arts, 1st. ser., VI, p. 120, fig. 2.

1900b—*Quadrula undulata* Simpson, Proc. U. S. Nat. Mus., XXII, p. 769.

1912b—*Crendonta undulata* Ortmann, An. Car. Mus., VIII, pp. 246—247.

ANIMAL CHARACTERS

Nutritive structures, as well as the reproductive, are identical with those of *Amb. rariplacata* in every respect. Even the glochidia

are similar, except slightly larger (0.210 x 0.220 mm). Like other members of this genus there is no trace of brilliant colors of the soft parts such as red or orange as seen in the *Fusconaia* or *Alasmidonta*.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elliptically subquadrate, compressed; rather thick and heavy umbones, not elevated, slightly inflated, sculptured by five, coarse concentric ridges most pronounced at base of post-umbonal ridge, slightly alated anteriorly; dorsal ridge high, with four or five upcurved costae; posterior half of shell crossed with five or six oblique undulations with shallow valleys; epidermis reddish brown to yellowish.

INTERNAL STRUCTURE:—Cardinals very heavy, double in both valves; laterals heavy, serrated; interdentum broad, thick; beak cavities deep narrow, crevice-like; muscle scars well impressed, vein markings on extra-antero pallial border; nacre white, often rusty spotted, with blue iridescence at posterior end.

Sex	Length	Height	Diameter	Locality
♂	112	x 73	x 36mm	(Osage R., Schell City, Mo.)
♀	76	x 55	x 32 "	(Gasconade R., Gascondy, Mo.)
♂	32	x 25	x 15 "	(Chariton R., Kern, Mo.)

Juvenile shells have coarse concentric undulations upon the umbonal region—especially at base of the post-ridge where they are upcurved; a single broad undulation at the post-ventral position of shell, a slight alation just anterior to the lunule; color of epidermis olivaceous.

MISCELLANEOUS REMARKS:—*Amblesma costata* Rafinesque is without question the *Unio undulatus* Barnes, but the trinomial name, *Amb. plicata costata* (Raf.), is used for taxonomic reasons as has already been explained under the remarks on this genus concerning the nomenclature incident to the revival of Rafinesque's "*Amblesma*." This species is very seldom seen in typical form in North Missouri, (never in North-West Missouri) and for that matter, it is also scarce in Central or South Missouri—but its actual forms are most abundant of all the *Naiad* species in this State south of the Missouri River. Most of the students of *Naiades* have returned the results of their studies of the *Missouri Amblesmae* indicating a greater prevalence of the "*undulata*" rather than the "*plicata*" form—especially for the swift clear-water mountain streams of the South. By actual surveys of some streams of

Central Missouri, where ecological conditions are the most diverse for the State, the author has been able to observe the same occurrence of the *Amblemae* as noted by Wilson and Clark in the Cumberland River (1914, p. 21) in that the more plicated and less inflated (*undulata*) one will be found in upper courses, while the smoother and more inflated (*plicata*) one is confined to the lower portions of the rivers where there is more mud and a weaker current. On the basis of not only these state-wide observations but also on these as limited to a single river, we would account for the existence of these two opposing types of *Amblema* as due to ecological rather than to genetic causes. However, as juvenile shells of two forms are different their origin would also indicate difference and the matter of their occurrence under certain ecological relations might, after all, be simply one of survival. A careful study of *Amb. costata* shows it to be a summer breeder, beginning in May and closing the latter part of July. As this "*undulata*" group has been understood better taxonomically than the "*plicata*" the geographic distribution of *costata* has also been better determined. Simpson reports it (i. e., his *Q. undulata* (Barnes)) for the Mississippi basin generally; also for the drainage basins of the St. Lawrence, the Red River of the North and the Alabama River. The varieties of this species, however, are reported by many for the area south and west of the Mississippi River known as the "South-West," the fauna of which is included in Central and South Missouri and bounded on the north by the *great faunal barrier, the Missouri River*.

Genus **Megalonaias** Utterback.

(*New Genus.*)

Type, *Unio heros* Say, 1829.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening very large with short papillae; anal and supra-anal also large, almost smooth, separated by short but distinct mantle connection; inner laminae of inner gills partly free from visceral mass or sometimes almost entirely connected; palpi long, enormous; color of soft parts, tan colored, with gills brownish.

REPRODUCTIVE STRUCTURES:—Marsupia occupying all four gills, when gravid enormous, padlike, not so distended at ventral

edge; conglutinates, sole-shaped, brown, rather solid; glochidia large, ventral margin obliquely rounded, hinge line long.

SHELL CHARACTERS.

Shell large, ponderous, broadly rhomboid, moderately inflated, post-dorsal ridge alated, sculptured with regular upcurved undulations; post-umbonal ridge broken with coarse plications running more or less parallel with it; beaks rather low, sculptured with coarse double looped-corrugations which extend out as nodules at base of post-ridge and as zigzag ridges all over umbonal region to upper part of disk; epidermis black; cardinals heavy; laterals long and straight; interdentum short; beak cavities narrowly deep; scars very deeply impressed—especially anterior retractor cicatrix; nacre white to pink.

MISCELLANEOUS REMARKS:—Because of the peculiarities of *heros* (Say) as to its animal and shell characters, as well as to its uniqueness of breeding season it is thought by the author in conference with other students, that this species of Say, very well deserves rank as the type of a new genus. Although the author has not examined the animal of *boykiniana* Lea, *triumphans* Wright, etc., yet, from shell characters, these allied forms would naturally fall under this new genus, *Megalonaias*. In all probability *crassidens* (Lamarck) [= *trapezoides* (Lea)], which has been grouped very near *heros* (Say), may also deserve a special compartment, according to the recent opinion of Mr. Frierson, who has made special study of this species abundant beds of which are very accessible to him; hence because of the difference of shell characters of *crassidens* from that of *heros* (or from any other *Naiad* shell in the possession of a "ventral scar" as pointed out by Mr. Frierson) this species of Lamarck is not grouped there. Besides *crassidens* is not found in Missouri, neither is *boykiniana*, *triumphans* and other conchologically allied forms of *M. heros* and thus the new genus will safely stand out for this State with its type, (*heros* Say), as the lone representative. *Bariosta* (Raf.) might be the available name for our new genus, if *crassidens* could be found to be congeneric with *heros*, since Rafinesque erected his genus for this species which he termed *ponderosus*, but which Mr. Walker, through his close study of Lamarckian types, says is Lamarck's *crassidens* that ante-dates Lea's *trapezoides* as well as Rafinesque's type. From the fact that *Crenodonta* (Schlüter) falls into the synonymy

of *Amblema* (Raf.) because of Simpson's and Ortmann's treatment, (preceded by that of Mörch in 1853) Schülter's name cannot be used. Thus it may be seen why an original name, "*Megalonaias*," (etymologically embodying a chief character) is herein submitted.

Megalonaias heros (Say)

("Giant Heros," "Washboard.")

Pl. VII, Fig. 16; Pl. VXII, Figs. 48 A—F.

1829—*Unio heros* Say, New Harm. Diss., II, No. 19, p. 291.

1831—*Unio multiplicatus* Lea, Tr. Am. Phil. Soc., IV, p. 70, Pl. IV, fig. 2.

1900b—*Quadrula heros* Simpson, Proc. U. S. Nat. Mus., XXII, p. 770.

1912b—*Crenodonta heros* (Say) Ortmann, An. Car. Mus., VIII., p. 248.

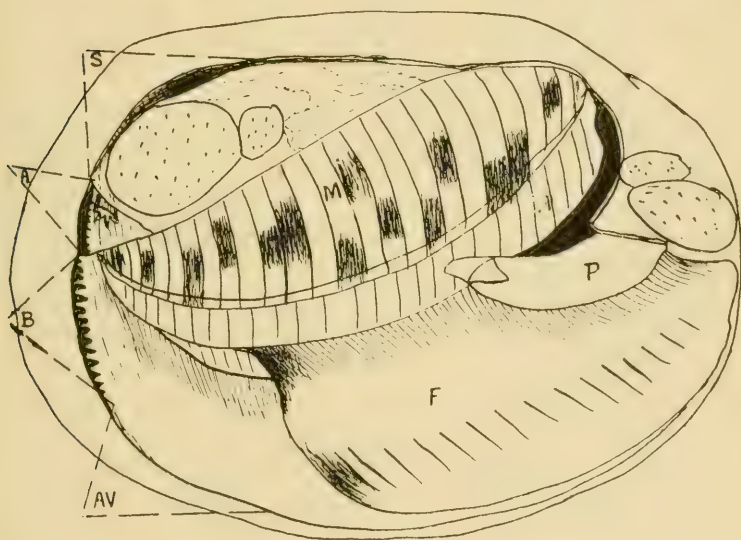


FIG. 2. *Megalonaias heros* (Say). ♀ Diagram of a gravid individual from Platte River, Garretsburg, showing animal characters in left valve. Coll. Jan. 25, 1913. ($\frac{3}{4}$ nat. size.)

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening very large, with comparatively few and small papillae branched at their tips; anal large, very finely dentate on outer edge; supra-anal immense, slightly but distinctly separated from anal by mantle

connection; anus tentacled: gills very long and large, inner much wider, inner lamina free from visceral mass for the posterior half or connected except for a slight slit at posterior end or even entirely connected; palpi enormous, connected about nine-tenths of their length antero-dorsad; soft parts mostly a fleshly-tan, branchial edges brown with yellowish papillae in incurrent opening, patch in front of branchial opening chamois-like.

REPRODUCTIVE STRUCTURES:—Marsupia occupying all four gills; when gravid, enormous purplish pads, obtusely rounded at ventral edges; ovisacs simple, undivided, some filled with rusty-brown mucus next to the laminae thus giving the marsupia a splotched appearance; conglutinates shape of an insole, rather solid, usually discharged whole, edges with brownish red pigment, rather thick with no thin transparent portions; glochidia large, post-ventral border obliquely rounded, hinge line long, nearly straight, no spines present, very vital, measures 0.280×0.340 mm.¹

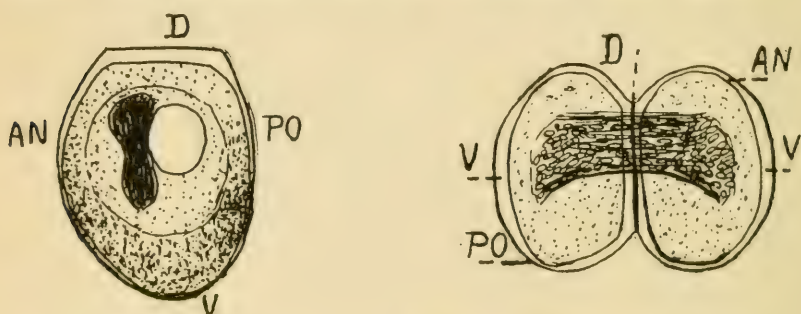


FIG. 3A. Mature glochidium of *M. heros* showing peculiar oblique post-ventral margin from lateral view. (x87—a camera lucida sketch. Left hand figure.)

FIG. 3B Ventral view of open glochidium of *M. heros*. (x87—a camera lucida sketch. Right hand figure.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell massive, heavy, subrhomboid, post-dorsal ridge rather high slopes of which ribbed with coarse, upcurved, regular undulations originating from umbonal region; post umbonal ridge broken with heavy undulations more

¹ According to Dr. T. Surber, (U. S. B. F. Doc., No. 813, 1915) this glochidium has the greatest variation in size and moreover, he has also found it parasitic upon the gills of the "water dog" (*Necturus maculosus*).

or less parallel to post-ridges; beaks rather low and full, sculptured with numerous corrugated or double-looped ridges extending out as prominent nodules on the post-umbonal-looped ridges and zigzag, or WM-shaped, ridges on the umbonal region and upper part of disk; epidermis black, more or less dull color.

INTERNAL STRUCTURES:—Cardinals moderately heavy, double in both valves; laterals very long, not much curved, interdentum short, narrow; beak and branchial cavities rather deep; muscle scar—especially the progressive impression and that of anterior retractor—very deep; nacre white (often with rusty spots) varying to pink.

Sex	Length	Height	Diameter	Locality
♀	150	x 116	x 56mm	(Platte R., Dixon Falls.)
♂	153	x 117	x 56 "	(" " Garretsburg.)
♀	100	x 78	x 39 "	(Osage R., Warsaw)
♀	77	x 55	x 25 "	(" " Monegaw Springs)
♂	43	x 27	x 12.5mm	(" " Warsaw)
♀	29	x 19	x 9.5 "	(" " Proctor)

The young and juvenile shells of the last two respective measurements are very profusely sculptured—no part of the external surface being smooth—yet no undulations appear as seen in adult. Beaks low, corrugated; slopes of post-dorsal ridge finely costated; post-ridge with coarse, apiculated or spurred nodules; center and anterior of disk covered with irregularly placed V-shaped ridges and with scattered tubercles; valves extremely flat; nacre sky blue, iridescent. "Work up old shells from the young ones" is Mr. Walker's advice.

MISCELLANEOUS REMARKS:—This most ponderous shell of the *Naiades* is typical in North Missouri and the Mississippi, but the typically massive shell is not found in Central Missouri, and, so far, it is not reported at all for the southern slope of the Ozarks in this state. As a rule, *heros* is only found in the large rivers; however, in this State the type is found in the Missouri Platte—a rather small river, while the medium sized one is found in the largest river of the interior—the Osage—where it assumes the small form perhaps approaching that of *dombeyana* Valenciennes. "Giant *heros*," as this species is often called, is most frequently found in the deepest depressions of mud bottom with a substratum of solid limestone. It hardly ever moves from these situations and perhaps because of this inactivity it accumulates its heavy shell. *Because of the following peculiar characters the*

author sees fit to create a new genus for *heros* of Say:—

- 1.—An unusually heavy shell, with zigzag or V-shaped, sculpturing on upper part of disk and corrugate sculpture on beaks.
- 2.—A tendency of the inner laminae of the inner gills to become more or less united with the visceral mass.
- 3.—The gravid marsupium an enormously distended pad, colored purplish, or slaty, with reddish splotches here and there parallel to the septa.
- 4.—Thick, sole-shaped, subsolid conglutinates with rusty-brown margins discharged more or less whole with glochidialying all through the conglutinated mass.
- 5.—A large, vital glochidium with post-ventral margin obliquely rounded.
- 6.—Breeding season intermediate, or tachytictic with late season (i. e., bearing glochidia in late winter but being sterile during the summer.)

From *Amblema* this peculiar species must be removed on account of its beak sculpture which is more like that of *Quadrula*—especially of the "*Lachrymosa*" group, yet it is separated from the latter chiefly by its ponderous shell and rugose, V-shaped sculpturing on the umbonal region and upper part of disk. It has been grouped under *Amblema* more on account of the oblique folds on post-half of its shell; however, these plications are, after all, usually disposed differently with respect to the post-umbonal ridge and are not so constant and numerous, nor do they appear so early in the life history of the shell, as in the type for *Amblema*. The special reason that a new genus should be built for *heros* is on the basis of its unique character of soft parts. No other generic type of Unioninae (nor of any of the *Naiades* for that matter) possesses such peculiarities of form, color or size for its marsupium, conglutinate or glochidium; and as to its nutritive structures, none are so eccentric regarding the connection of the inner laminae to its inner gills. Its idiosyncrasy of breeding habits would not only give it a special station, aside from all other *Naiades* so far known, yet this physiological character may account for its oddity morphologically. The author has kept an accurate breeding record of *heros* throughout the year—especially for the winter months when other records have been incomplete—to find it gravid with ova of early embryos in fall and early winter.

with late embryos and immature glochidia in midwinter, and with mature larvae in late winter but barren from April to August. Ovulation has been observed for the latter part of August and unfertilized ova have been found in the ovaries August 19th. Sperm having been found within the visceral mass without being accompanied by ova for those individuals that possess gills without the crowded septa of the female proves the sexes distinct and separate and thus disproves the claim of hermaphroditism for this species. It is true that during the height of the breeding season that all individuals found seem to be females but this is the time when there is greater activity among females; hence, they may be more in evidence while the males remain inactive and burrowed from ready accessibility during this season. This fact may account for the so-called hermaphroditism among other species. By laboratory tests the writer has kept the glochidia of this species alive in cold, clear, fresh water exactly thirty days (five time longer than the life of any other mature glochidia submitted to this watch-glass test) after being taken from the mother. This unusual vitality of the larvae is an adaptation to its prolongation of breeding season into late winter when they are discharged into the ice-cold water and left to their fate, for it is the belief of the writer that they are discharged as soon as mature.

Genus *Quadrula* Rafinesque.

1820—*Quadrula* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 305.

1852—*Rotundaria* Agassiz, Arch. fur, Naturg., p. 48.

(Type, *Obliquaria* (*Quadrula*) *metanevra* (Rafinesque).

ANIMAL CHARACTERS:—Branchial opening large with short arboreal papillae; anal smooth to finely dentate; supra-anal very large, briefly and loosely connected to anal by mantle edges; inner laminae of inner gills free from visceral mass; palpi large, somewhat sickle-shape; color of soft parts not bright, except for brownish gills and palpi, tannish or soiled white; marsupia occupying all four gills, when gravid ovisacs swell moderately in center, ventral edge obtusely pointed; conglutinates white, leaf-like, sometimes divided at distal ends; glochidia small to medium in size, subovate, spineless.

SHELL CHARACTERS:—Shell roundly quadrate, or subrhomboidal, occasionally elongate with moderately high beaks sculptured with 3-4 parallel ridges developed on post ridge to nodules;

disks usually sculptured; epidermis generally dark colored, rayless or with greenish splotched paintings; cardinals heavy, double in both valves, ragged; laterals double in left, single in right; beak cavities deep, compressed or creviced; shells mostly not sexually dimorphic.

MISCELLANEOUS REMARKS:—This genus naturally falls into three groups as follows:—

I. *Pustulosa* Group.

This group is mostly represented in this State by the northern and western form, *Q. pustulosa schoocraftensis* (Lea), and is characterized by its greater inflation, smoother, larger and more elongated shell with beaks drawn back up more toward the center of the dorsal line; beak sculpture concentric. The actual typical *pustulosa* is rarely, if ever, found in Missouri.

II. "*Lachrymosa*" Group.

This is represented in Missouri by *Q. quadrula* (Raf.) (= *lachrymosa* Lea), *nodulata* (Raf.), *fragosa* (Conrad), *aspera* (Lea), *verrucosa* (Raf.), *nobilis* (Conrad) and their intergrades, and may be characterized briefly by a somewhat quadrate or trapezoidal shell, profusely sculptured disk with tubercles arranged in two radiating rows from the beaks to ventral margin divided by a more or less broad radial furrow; beak sculpture double-loop type.

III. *Metanevra* Group.

This third group is only represented in this state by *Q. metanevra* (Raf.) and *cylindrica* (Say) and is characterized especially by its height and coarsely sculptured umbonal ridge in front of which is a depression but no definite radial furrow and by its peculiarly triangular greenish splotches; beak sculpture double-looped or zigzag type.

The genus *Quadrula* tends toward an unusual intergradation of forms among the above groups in this state and because of this fact the genus might be more properly treated under various sub-genera for this catalogue; however, this treatment may be made unnecessary by the elimination of all the intergrades except those that possess the nearest approach to types. As to soft parts, this genus is identical with *Amblema* but is especially separated from the latter by the negative shell characters of oblique folds across the disk. Simpson, who bases much upon deep beak cavities, as one of the special characters of this genus,

includes more under this group, that is, the genera, *Fusconaia*, *Amblema*, *Megaloniais*, *Rotundaria*, *Plethobasus* and even some species of *Pleurobema*.

Quadrula pustulosa (Lea)¹

("Warty-Back," "Warty Pigtoe," "Pimple Back.")

Pl. XVII. Figs. 41 A and B.

1831—*Unio pustulosus* Lea, Tr. Am. Phil. Soc., IV, p. 76, pl. VII, fig. 7.

1834—*Unio nodulosus* Say., Am. Conch., VI.

1898—*Quadrula pustulosa* Baker, Moll. Chicago, Pt. I., p. 86, pl. XXV.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with yellowish plumed tentacles; anal smooth; sura-anal very closely connected—even disconnected—by mantle edge; inner lamina of inner gills free from visceral mass; color of soft parts dingy white; palpi connected for about one-third of their length.

REPRODUCTIVE STRUCTURES:—All four gills entirely marsupial, septa crowded, ovisacs narrow; conglutinates white, leaf-like, broken; glochidia large, semi-elliptical, spineless, hinge line short and evenly curved, measures 0.230 x 0.300mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell ovate-quadrate, higher than long, post-umbonal ridge almost horizontal, posterior half pustulate to smooth, dorsal ridge with nodulous costae; beaks protruding anteriorly sculptured concentrically with upcurved ridges posteriorly; epidermis rusty brown with sometimes broad green banded rays diverging from beaks.

INTERNAL STRUCTURES:—Cardinals heavy just under beaks; interdentum broad, upright; laterals straight, at right angles to interdentum; umbonal cavity compressed, deep; nacre white.

Sex	Length	Height	Diameter	Locality
♀	52	x 46	x 32mm	(Miss. R., La. Grange, Mo.)
♂	60	x 60	x 38 "	(" " " " ")
♀	54	x 55	x 34 "	(" " Hannibal, ")

No juvenile shells have been obtained for descriptions; this species is so rare in its typical form for this State that adult shells have been secured with difficulty.

¹ The name of this species should read *Q. bullata* (Raf.) if we accept Rafinesque's evident description of it in his Monograph (1820, p. 41).

MISCELLANEOUS REMARKS:—Typically this species is a small shell, very upright with beaks protruding extremely anteriorly and with irregularly arranged pustules over its disk. In this latter character it is separated from *Q. nodulata* with which it is often confused; then too *nodulata* is not so rotund. *Pustulosa* is more typically a southern shell while its variety, *schoolcraftensis*, is more of a northern and western form. Its favorite home is clear water and rather swift streams and is associated with *Q. sphaerica*, *refulgens*, *mortoni*, etc.,—all of which are not found in Missouri; on the other hand its northern relative (*schoolcraftensis*) is more of a lover of mud bottom and sluggish current. It is strange that this species is not found in South Missouri where its ecological conditions are most favorable; however, it is not at all common anywhere in the great South-west. It is occasionally found in Central Missouri but mostly in varietal forms. The Mississippi River is the only locality for anything like its type. It should be a species of wide distribution since its host distributor is the common crappie (*P. annularis*).

***Quadrula pustulosa schoolcraftensis* (Lea).**

("Warty-Back," "Pimple-Back.")

Pl. XVII. Figs. 42 A—D.

1834—*Unio schoolcraftensis* Lea, Tr. Am. Phil. Soc., V., p. 37, pl. III, fig. 9.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large, low, with short arboreal papillae; anal obscurely crenulated; supra-anal closely connected to anal but not deciduous; gills tilted at an abrupt angle, inner laminae of inner gills entirely free from visceral mass; palpi unusually long, somewhat curved; except brownish gills and palps the soft parts are dull whitish or tan.

REPRODUCTIVE STRUCTURES:—All four gills marsupial, septa crowded, ventral edges pointed and distended slightly in center when gravid; conglutinates white with thin, transparent spots arranged transversely in rows; glochidia same in form as the parent species, but a little larger (0.235 x 0.320).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell large, subquadrate, ventral margin gently curved, moderately inflated, thick, heavy; posterior

half profusely and irregularly pustulate to smooth; beaks rather high, moderately inflated sculptured concentrically but faintly; epidermis dark straw to chocolate brown in color.

INTERNAL STRUCTURES:—Cardinals heavy, irregular, double in each valve; inter-dentum broad, at right angles to laterals; laterals heavy, double in left, single in right; scars deeply impressed; umbonal cavities compressed by deep crevices; nacre usually white, iridescent especially posteriorly.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	70 x	58 x	41 mm	0.310	(Platte R., Agency, Mo.)
♂	60 x	50 x	30 "	0.300	(Grand R., Darlington, Mo.)
♀	42 x	36 x	26 "	0.295	(Platte R., Claire, Mo.)
♂	17 x	14 x	8 "	0.300	(Grand R., Utica, Mo.)

Since *schoolcraftensis* is one of the greatest occurrence in individuals for this state, the writer has been able to secure the largest collection of its adolescent shells than any of the *Naiades* in Missouri. The above latter measurement is that of the *smallest one but it was without byssi*. Its general outline is more elongated than the mature shell, resembling the adult *Q. quadrula*, post-umbonal ridge more prominent, beaks fuller, almost drawn back to the center of dorsal line, characteristically painted with a bright, broad, fan-shaped, green ray at base of post ridge within the original shell area; beak sculpture indistinct, concentric, broken anteriorly by a radiating furrow directed out on disk.

MISCELLANEOUS REMARKS:—The differences of this variety from the species has already been mentioned under the description of the genus. This form was not admitted by Simpson as a race and is merely referred as "a nearly smooth, compressed form of *pustulosa*." The varieties of typical *pustulosa*, indeed, are great—especially as to disposition of pustules, etc., but this larger more characteristically quadrate form is so abundant in the north and west, where *pustulosa*-types are rarely found, that it surely deserves a separation into the subspecific, if not specific class. According to the figure and description that triangular variety found in the Ohio River, (that is, Lea's *pernodosa*,) might be a synonym of *schoolcraftensis*. Taking it all in all this subspecies is purely a geographical race, but may pass into normal form in a few places, even in the north and west, such as in the Mississippi River, Illinois and local points where clear water and swift streams are found. *Schoolcraftensis* is a lover of quiet, muddy situations,

where it has developed a heavier, less pustulose shell as we note in the ecologic results for some shells of *Amblemae*. This form is reported also for the St. Lawrence basin as well as through all the northern part of the Mississippi Valley, even down into the South-west as far as Kansas and Oklahoma. The writer has been able to keep a good breeding record for this very accessible form for Missouri to find it only gravid through June and July.

Quadrula pustulosa asperata (Lea).

Pl. XVII. Fig. 42 A and B.

1861—*Unio asperatus* Lea, Pr. ac. Nat. Sci. Phila. V, p. 41; Jl. Ac. N. Sci. Phila., V., p. 68. Pl. VII. Fig. 218.

ANIMAL CHARACTERS:—Soft parts have been examined afield and found to be identical with those of the parent species. None were found gravid. All four gills of sterile females were marsupial in character through the test of finding more crowded septa.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Subtrigonal, very upright, higher than long, post-umbonal ridge moderately inflated, dorsal line rather straight, ventral margin abruptly curved, rounded posteriorly, subtruncated anteriorly; beaks well forward and eroded; tubercles few, disposed on upper part of disk; epidermis reddish brown to black.

INTERNAL STRUCTURES:—Identical with those of type, *pustulosa* except perhaps a broader, thinner and more upright interdentum.

Sex	Length	Height	Diameter	Locality
♂	44 x	46 x	28mm	(Osage R., Warsaw, Mo.)
♀	50 x	48 x	32 "	(" " Osceola, Mo.)
♂	46 x	46 x	31 "	(" " Bagnell, Mo.)

MISCELLANEOUS REMARKS:—The form of the above description is of rare occurrence in the Osage River, but still the other form for this state, *schoolcraftensis*, does not occur much oftener in this river. According to Mr. Bryant Walker this is "a western form of *Q. pustulosa* and if it came from the Coosa River, Alabama, it would surely be referred to *Q. asperata* (Lea)." Comparisons to the actual shell from Alabama (Coosa R., Cedar Bluff) shows it to be almost identical both as to external and internal features.

Quadrula quadrula Rafinesque.

("Maple Leaf," "Monkey Face," "Tear Shell.")

Pl. IX., Fig. 19; Pl. XVIII., Figs 45 A—F.

- 1820—*Quadrula quadrula* Rafinesque, An. Gen. Sci. Phys. Brux. p. 305.
 1828—*Unio lacrymosus* Lea, Tr. Phil. Soc., III, p. 272, pl. VI, fig. 8.
 1831—*Unio asperrimus* Lea, Tr. Am. Phil. Soc., IV, p. 71, pl. V., fig. 3.
 1834—*Unio quadrulus* Say, Am. Conch, VI.
 1898—*Quadrula lachrymosa* Baker, Moll. Chicago, Pt. I, p. 83, pl. XXV., fig. 1, XII, fig. 2.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening rather large with arboreal papillae; anal slightly crenulate; supra-anal very large closely connected to anal by mantle edges; palpi very long united about two thirds of their length antero-dorsad and heavily vein marked; inner laminae of inner gills free from visceral mass; color of most soft parts tanned flesh color.

REPRODUCTIVE STRUCTURES:—All four gills marsupial; ovisacs wide in middle transversely, ventral positions being divided, giving the white conglomerates a double or triple split appearance, septa thickened at intervals leaving thin transparent elongated spots arranged regularly and transversely in the conglomerates; glochidia not found by writer; Dr. Surber reports it as the smallest of the *Quadrulae*; color of charged marsupia brown; crenulated flap on post-dorsal part of foot; probably sexual in function as only noted in females.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell medium in size, subquadrate to subtrigonal, dorsal ridge more or less alated with costae on slopes undulated or sulcated post-umbonal ridge prominently angled set with coarse tubercles, a valley or radial furrow in front bounded anteriorly by a row of more or less irregularly placed tubercles on center of inflated disk, presenting the appearance of drops of melted wax; epidermis varies from olive green to chest nut brown or even black, in some instances faintly rayed anteriorly and with continuations of green paintings ventrad to some of the tubercles; beaks high, full, furrowed, post-obliquely, sculptured with corrugated, concentric ridges that break into great numbers of small tubercles out on the umbonal region.

INTERNAL STRUCTURES:—Cardinals more or less double in both valves; laterals inclined to double also; umbonal cavities deep and rounded out; nacre white iridescent.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	115	x 75	x 51mm	x 0.210	(Lake Contrary, St. Joseph, Mo.)
♂	90	x 65	x 48 "	x 0.220	(Platte R., Agency Ford)
♂	86	x 70	x 38 "	x 0.350	(Flat Creek, Sedalia, Mo.)
♀	68	x 54	x 29 "	x 0.325	(Auxvasse R., Fulton, Mo.)
♂	8	x 5	x 4 "	x 0.300	(Grand R., Utica)

The above measurement is the smallest ever taken by the author. It was discovered stranded on a sandbar, where it was traced by its tiny furrowed track in the fine wet sand. Although it had been but few days since its escape from its parasitic life on the fish, yet it had no byssi. It would seem from this, and many other instances, that neither the *Unioninac* nor *Anodontinac* develop byssal threads. Three other juveniles found on this same bar (measuring 11, 13 and 22 millimeters) were also devoid of byssi. It has been the author's experience to find juveniles in companies. The juvenile *quadrula* has the general appearance of a young *fragosa*, having a straw-colored epidermis, very pointed posterior end, deeply sulcated post-ventral position, full rather double-apiculated beaks, with corrugated sculpturing and placed almost in the middle of the dorsal line; tubercles rather folded on anterior umbonal slopes ridged on post-umbonal slopes and finely ribbed on post-dorsal slopes.

MISCELLANEOUS REMARKS:—*Q. quadrula* is represented by many forms in this state—especially in Central Missouri; however, the large, heavy form that ranges from Ohio to Nebraska is rather constant in the drainage basins north of the Missouri River. It is strange that there should be such a depauperization of any of these forms in South Mo. This species is found in Arkansas but rather in the *aspera* form, a small *quadrula* such as mostly seen in the Osage system. Mr. Walker thinks that the key for tracing out the relative ranges of forms might be found in some ancient drainage system, and varieties, such as found in Missouri, ought to help solve the question. The inflated, solid and comparatively smooth variety of *Q. quadrula* of North Missouri may be referred to Pratt's *Udio lunulatus* (Proc. Dav. Ac. Nat. Sci., I. 1876, p. 167, Pl. XXXI, fig. 1). However, this may simply be the lacustrine form of the type since the fluviatile forms of North

Missouri approach more the typical *quadrula* in being more compressed and more tuberculated. Perhaps the most typical *quadrula* of Missouri is to be found in the geographic center of the state where the flatter, thinner and more "lachrymosed" shell occurs. As in many of the species of these related genera the intergrades are so numerous that we can consider only the most striking ones that may be traced to mere local conditions. The author has found this species to be the most sensitive to discharge its conglutinates immaturesly when disturbed from its natural bed and then, too, since conglutinates, spawned in nature, have been examined to find them containing late embryos it is to be inferred that maturity may take place outside. Hence we may account for our difficulty in securing the mature glochidia from the ovisacs of the mother. The writer has examined hundreds of gravid *quadrula* in mid- and late summer only to find every stage of embryonic development except the glochidial. In this respect this species resembles *Q. verrucosa* and the fact that the ovisacs of each contain unusually large quantities of mucus may have some association with their eccentric breeding habits. The breeding season of *Q. quadrula* is from May to August and hence is tacyctic.

Special attention is given here to a deeply sulcated form of this species which occurs rather commonly in our North West Missouri lakes but which may only be a pathologic condition due perhaps, to parasitic attacks upon the mantle glands that build up the shell. Three type shells measure as follows:

Sex	Length	Height	Diameter	Um. ra.	Locality
♂	85	x 70	x 57mm	0.485	(Lake Contrary, St. Joseph, Mo.)
♀	80	x 55	x 54 "	0.450	(" " " " ")
♂	48	x 38	x 40 "	0.435	(" " " " ")

These measurements show an unusual inflation and extraordinary position of the umbones. If this should be a normal form it would deserve specific consideration because of the deep post-dorsal sulcation and also because of the wide, deep radial furrow in front of the prominently angled post-umbonal ridge. However, since Mr. Frierson concurs with the author in the belief that it *may only be* "a strange freak" after all it would be dismissed here with only the reference to its photograph (Pl. XVIII, Figs. 46 A and B.)

Quadrula quadrula contraryensis Utterback.

(Round Maple Leaf.)

Pl. XVIII, Fig's 47 A and B.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Same as that of the parent species, except for an absence of a supra-anal opening, a difference in the greater posterior extension of foot and also a general difference of form of soft parts due to a more rounded shape of shell.

REPRODUCTIVE STRUCTURES:—Identical with that of the parent species except for shorter, wider marsupia.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell medium in size, suborbiculate, abruptly curved before, broadly rounded behind with very slight incurvature post-ventrad; well inflated, inclined to globosity; beaks full, high up on dorsal line (as indicated by the large average umboidal ratio of 0.495); tubercles few and small, mostly on umbonal area; post-umbonal ridge rounded, scarcely sculptured; sculpturing on beaks corrugated as on parent species; epidermis olivaceous.

INTERNAL STRUCTURES:—Cardinals different from parent in being reduced to a single, jagged tooth in right valve; somewhat double in left; interdentum long, wide, not so deeply gashe'd in right valve for the reception of the post-right cardinal; umbonal cavity deep, basin-like; nacre an unblemished white.

Sex	Length	Height	Diameter	Um. ra.	Locality
♂	73.5	x 64.5	x 44.0mm	0.495	(Lake Contrary, St. Joseph, Mo.)
♀	76.0	x 66.0	x 45.0 "	0.500	(" " " " ")
♂	84.0	x 70.0	x 59.0 "	0.483	(" " " " ")
♀	41.0	x 36.0	x 38.0 "	0.520	(" " " " ")

The young shell of the last measurement shows an approach to the parent shell. The comparatively deep sulcation at the post-ventral portion of the shell disappears as seen in a shell series of fairly close connection in ages.

MISCELLANEOUS REMARKS:—The author of this sub-species is satisfied that he has a sufficient collection of this peculiar shell taken from different parts of Lake Contrary, St. Joseph, Missouri, to prove the validity of this form as a variety of that very common,

heavy shell, that occurs in the Mississippi Valley, North of the Ohio and also of the Missouri Rivers. The differences in this upright, rounded shell from its parent are stated in the comparative description. Since students of *Naiades* have pronounced it a variety, if found in sufficient numbers, the author concurs by naming it for its type locality, Lake Contrary, St. Joseph, Mo. Wherever found in this lake, the bottom is a soft, marly mud, and the situations are in rather deep water sheltered from wave action. The author has discovered a short period breeding season for *contraryensis*.

***Quadrula nodulata* Rafinesque.**

("Pimple Back," "Warty Back.")

Pl. XVII, Figs. 44 A and B.

1820—*Obliquaria nodulata* Rafinesque, Bivalves of River Ohio, Ann. Gen. Sci. Phys. Brux.

1834—*Unio pustulatus* Lea, Tr. Am. Phil. Soc., p. 79, Pl. VII, fig. 9.

1834—*Unio nodulatus* Say, Am. Conch., VI.

ANIMAL CHARACTERS:—Nutritive structures absolutely identical with those of *Quad. pustulosa* (Lea). The glochidial characters are the same, except a difference in size, the glochidium of *nodulata* being the larger 0.230 x 0.290 mm. However, small differences in size may not be considered good distinctions as it is the glochidial form that is to be taken into greater account.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell medium in size, solid, sub-orbicular, inflated, post-dorsal ridge projected; umbones very full, high, incurved bearing three or four small corrugated, concentric ridges; post-umbonal ridge and central part of disk ornamented with two radial rows of small, erect pustules sometimes terminating with half-tubercles at ventral margins; epidermis light tan to dark horn.

INTERNAL STRUCTURES:—Identical with *pustulosa*.

♂	48	x	40	x	30	mm	0.200	(Miss. R., Hannibal, Mo.)
♀	45	x	38	x	28.5	"	0.250	(" " " ")
♂	32	x	28	x	23	"	0.210	(" " " ")

Shell of juvenile subglobose, post-umbonal ridge prominent, post-dorsal ridge short, high; tubercles few in two rows—one on post-ridge—no radial furrow between; beaks very full, sculptured

by rather coarse, irregular ridges, extending as tubercles on the disk; epidermis yellowish green with alternate bands of brown and straw color. Interior of shell much like adult except not so broad, nor as upright, nor as long; nacre white with light blue iridescent sheen posteriorly.

MISCELLANEOUS REMARKS:—*Q. nodulata* seems to be only a globular-shaped *Q. quadrula* and is more typically a southern shell; however, it is occasionally met with in the Upper Mississippi, where it is most found in this State. Mr. B. F. Bush collected some miscellaneous shells from the interior of the state and donated them to the United States Museum where some were identified as this species. It is to be distinguished from *Q. pustulosa* especially by two regular radiating rows of widely separated tubercles obliquely arranged from the umbones to the ventral margin on the posterior half of the disk; then, too, it is more inflated, is not so upright, has greater umboidal ratio, has more of an alated dorsal ridge and belongs to the so-called "*Lachrymosa*" Group, whereas, *pustulosa* is a member of the first group of this Genus of which it is the type; hence, the latter is, after all, not even closely allied. However, there is not much difference between these two *Quadrulac* as to the form and size of their larvae, and as to form of adult shell, it lies nearer to the variety, *contraryensis* of *Q. quadrula*. Surber (1913, p. 113) finds this species to be a gill parasite upon the crappie (*Pomoxis annularis*) as an occasional host. As to its breeding habit, it is tachytictic.

Quadrula fragosa (Conrad).

("Hickory Nut Shell.")

Pl. XVIII, Figs. 48 A and B.

1836—*Unio fragosus* Conrad, Monog. of Fresh-water Shells, II, p. 12, Pl. VI., fig. 2.

ANIMAL CHARACTERS.

NUTRITIVE AND REPRODUCTIVE STRUCTURES:—Identical with *Q. quadrula* as far as can be determined, with the scanty supply of material at hand—none of which is in gravid condition. However, Wilson and Clark (1914, pp. 59 and 60) report it with all four gills marsupial, thick, pad-like. Glochidium unknown.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell most quadrate of the *Quad-*

rulae, medium in size, greatly inflated, characteristically sulcated post-ventrad; dorsal ridge prominent, the slopes coarsely costated; post-umbonal ridge prominent and profusely tubercled; radial furrow deep and wide, in front of which another row of rather scattered tubercles extend from the beaks post-ventrad across the disk; epidermis dark yellowish.

INTERNAL STRUCTURES:—Identical with those of *Q. quadrula*.

Sex	Length	Height	Diameter	Locality
♂	63	x	59	x 35mm (Miss., R. Hannibal, Mo.)
♀	44	x	39	x 18 " (" " " ")
♂	23	x	16	x 9 " (102 R., St. Joseph, Mo.)
♂	15.5	x	6.5	x 7 " (Osage R., Schell City, Mo.)

It may be that the juvenile shell measurement of the last two above is only that of *Q. quadrula* since all juveniles of the latter possess the characteristic sulcation at the post-ventral portion of the shell as well as the profuse costation on the slopes of the post-dorsal ridge; hence, the inference the author would draw in asserting that *Q. fragosa* may be an occasional instance of an overgrown shell of *Q. quadrula*.

MISCELLANEOUS REMARKS:—This type of Conrad is of rare occurrence in this State, the Mississippi being the only place where anything like its type may be found with any degree of assurance. Abnormal forms of *fragosa* are seen occasionally in the headwaters of the Osage. Simpson is not certain about the distribution of *fragosa* outside of the Ohio and Tennessee—Cumberland systems. It is mainly distinguished from typical *Q. quadrula* by being more squarely quadrate, more inflated and the upcurved tubercular costae on the rounded post-dorsal ridge being more pronounced. It differs chiefly from *aspera*, (the small *Q. quadrula* form of the Osage) in not being biangulated posteriorly. It has been found to belong to the short period breeders.

Quadrula aspera (Lea).

("Little Rough Shell.")

Pl. XVIII, Figs. 49 A and B.

1831—*Unio asper* Lea, Tr. Am. Phil. Soc., IV, p. 85, pl. IX, fig. 15.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening finely papillose; anal smooth; supra-anal loosely, to deciduously, connected to anal by mantle edges; inner gills much wider (posteriorly),

inner laminae of inner gills free from visceral mass; palpi long and broad; soft parts a light tan.

REPRODUCTIVE STRUCTURES:—Marsupia identical with those of *Q. quadrula*. No gravid forms found.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, subquadrate, biangulated behind, the biangulation pointed ventrad; post-dorsal ridge costated; post-umbonal ridge prominent, profusely tubercled; radial furrow rather wide and shallow, bounded in front by a rather scattered row of sharp tubercles; epidermis blackish.

INTERNAL STRUCTURES:—Identical with those of *Q. nobilis* which are somewhat peculiar.

Sex	Length	Height	Diameter	Locality
♀	52	x 46	x 29mm	(Osage R., Warsaw, Mo.)
♂	44	x 39	x 27 "	(" " " " ")
♀	40	x 38	x 24 "	(" " " " ")

MISCELLANEOUS REMARKS.—Although this species has only been found in the Osage basin for this State, yet it is not to say, a very common shell there. So closely related is this small form of *quadrula* to *Q. nobilis* that a good series of shells may reveal it as the young of *nobilis*. *Aspera* has been considered the southern form of *Q. quadrula* and it may be the small multi-tuberculated representative of the South-west which is connected geographically by all forms of intergrades to that large, heavy, smoother representative of the North Mississippi Valley.

Quadrula nobilis (Conrad).

("Big Buck Horn," "Maple Leaf.")

Pl. XIX. Figs. 51 A and B.

1854—*Unio nobilis* Conrad. Jl. Acad. Nat. Sci. Phila., II, p. 297, Pl. XXVII, figs. 2 and 3.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with feathered papillae, anal crenulated, supra-anal without mantle-connection to anal—hence both openings virtually one, gills long, rather narrow, inner laminae of inner free only one-half way, palpi enormous connected two-thirds of their length antero-

dorsad, color of soft parts tan, for most part, mantle edges at siphonal openings black, gills and parts above darker tan than parts below.

REPRODUCTIVE STRUCTURES:—Only sterile marsupia observed; all four gills, however, marsupial and same in structure as that of *Q. verrucosa*; glochidium not found.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell roughly pentagonal in general outline, heavy, thick, solid, compressed posteriorly, inflated for one-half of the shell anteriorly, obtusely biangulated behind with truncation obliquely antero-ventrad, broad, shallow, radial furrow, post-umbonal ridge flattened and sculptured with few tubercles, area in front of radial furrow irregularly and coarsely tuberculated, slopes of post-dorsal ridge with low upcurved costae, epidermis dark brown, growth lines coarse.

INTERNAL STRUCTURES:—Cardinals and laterals both distinctly doubled in the two valves, interdentum short, wide, cut away in right valve for the post-left cardinal, anterior adductor muscle scars usually drawn to the front, nacre milky white.

Sex	Length	Height	Diameter	Locality
♀	120 x	88 x	57mm	(Marais des Cygnes R., Rich Hill,)
♂	80 x	56 x	30 "	(Osage R., Greenwell Ford)
♀	56 x	46 x	27.5mm	(" " " ")

No juveniles were obtained. The last measurement, is that of the smallest in the writer's collection, but shows no real juvenile characters, and is more like *Q. aspera* except for its difference in posterior biangulation and also in its tuberculation.

MISCELLANEOUS REMARKS:—Simpson (1900b, p. 776) puts *Q. nobilis* down in the synonymy of *aspera*, but later refers it to *Q. verrucosa*. However, from studies of its peculiar anatomy and internal shell structures it may come very near to *verrucosa*. This is a rather common species for the Osage where it reaches a larger, heavier growth of shell than is ever attained by *verrucosa*. It is also a broader, shorter shell with great solidity and inflation anteriorly and also greater compression posteriorly. *Nobilis* is reported by Isely (1914, p. 4) for the lower Neosho basin. It likewise appears occasionally in this same drainage for Missouri and is also found in the Grand River of North Missouri. Like *R. tuberculata* (Raf.), *nobilis* may be said to have no true supra-anal opening due to its lack of mantle connection between the anal and

supra-anal region. This lack of mantle connection is a constant character in this species, whereas this deciduity is inconstant among other *Quadrulae*. The fact of its partial union of the inner laminae of the inner gills with the visceral mass is also a departure from the general characters of this genus and a step toward the modern arrangement. In this latter character *nobilis* is somewhat like *Megaloniais heros*. From the fact that females were found sterile all through early and mid summer, it may be inferred that its breeding season is very short and begins early in spring, or like, *heros* begins late in the season. Later investigations may relate this species more closely to *Megaloniais* for the physiological reasons as well as for the morphological.

***Quadrula verrucosa* Rafinesque.**

("Deer Horn," "Buck Horn.")

Pl. XIX, Figs. 50 A—D.

1820—*Unio (Obliquaria) verrusoca* Rafinesque, Ann. Gen. Phys. Brux.

1823—*Unio tuberculata* Barnes, Am. Jl. Sci., VI, p. 125, Pl. VII, figs., 8a, 8b.

1899—*Tritogonia tuberculata* Simpson, Pr. U. S. Nat. Mus., p. 608.

1912a—*Quadrula tuberculata* Ortmann, Ann. Car., Mus., p. 254.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely set with arboreal papillae, anal crenulated, supra-anal smooth, very large, slightly (even deciduously) connected to anal by mantle edges; gills very long, comparatively narrow, inner broader, inner lamina of inner gills connected to visceral mass except for a short distance anteriorly; palpi very long, connected antero-dorsad for a little more than half their length; color of soft parts, mostly solid white, gills brown.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell rather large, elongate, roughly trapezoid; male shell shorter, more pointed posteriorly and angled dorsad; female shell much longer, biangulated post-ventrad; disk profusely tuberculated, the coarser tubercles located ventrad; post-umbonal ridge prominent and nodulated; slopes of post-dorsal ridge faintly costated, beaks rather small, apiculated, sculptured with double-looped, zigzag markings that extend out on the disk; epidermis chestnut brown to dark horn color.

INTERNAL STRUCTURES:—Cardinals heavy, ragged, double in left usually single in right; laterals long, rather straight and heavy; beak cavities deep; nacre marble white, occasionally pink, iridescent posteriorly

Sex	Length	Width	Diameter	Locality
♀	169	x 88	x 48	(Grand R., Darlington)
♂	150	x 78	x 44	(Platte R., Agency Ford)
♂	110	x 50	x 30	(Osage R., Warsaw)
	54	x 30	x 15	(White R., Hollister)

No juveniles obtained. The last measurement is that of the youngest *verrucosa* obtained. Its beak sculpture and disk are entirely sculptured with nodules and tubercles. The slope of the post-dorsal ridge are sculptured with three or four coarse, costated undulations and with numerous fine costae arranged dorsad; shell very greatly compressed; nacre bluish.

MISCELLANEOUS REMARKS:—*Q. verrucosa* is the most peculiar species of its genus on account of the sexual dimorphism of its shell. For this reason especially, Simpson created a special genus (*Tritogonia*) for it. Some students are inclined to think that *Tritogonia* deserves sub-generic rank at any rate, because of its morphological departure from the typical *Quadrula* shell. Its soft parts, however, are so identical with those of the typical *Quadrula* that there is no reason for its groupings with any other genus. Even though the form of the shell may be different, yet its conchological parts correlate with those of other *Quadrulae*. Although Rafinesque's figure of this species is abominable, yet an unbiased study of it, together with that of his good description, would give preference for the adoption of his *verrucosa* over that of Barnes' *tuberculata*. Like *Q. quadrula*, its breeding season is about as eccentric, in that the mature glochidia are not retained in the marsupia for any length of time; hence this accounts for the great difficulty of securing its larvae for study. Surber was fortunate in securing specimens with ripe glochidia June 10th. The writer would judge from this record and that of his own (i. e., sterility for the Fall and Winter months) that this species is tachytictic. *Verrucosa* has the widest distribution for this State: however, it varies somewhat in size, inflation, disk sculpture, nacre-color for the different sections of the State; e. g., the pink-nacred ones are exclusively confined to the Southern Missouri streams.

***Quadrula metanevra* (Rafinesque).**

("Maple Leaf," "Monkey-face" "Stranger.")

Pl. XIX, Figs. 53 A and B.

- 1820—*Obliquaria* (*Quadrula*) *metanevra* Rafinesque, Ann. Gen. Sci. Brux., V, p. 305. Pl. LXXXI, fig. 15 and 16.
1834—*Unio metanevrus* Say, Am. Conch., VI.
1900b—*Quadrula metanevra* (Raf.) Simpson, Proc. U. S. Nat. Mus., XXII, p. 774.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with short feathered papillae; anal smooth to finely dentate; supra-anal very long, open, closely connected by mantle edges to anal; gills short and wide the anterior connection of outer to mantle far removed from base of palpi, inner laminae of inner gills free from visceral mass; palpi long, pointed, connected for one-third of their length; color of soft parts mostly a dingy white, the only different color being a straw-yellow of the mantle margin at branchial opening.

REPRODUCTIVE STRUCTURES:—All four gills marsupial, septa and water tubes (ovisacs) well developed, when gravid, marsupia moderately swollen, ventral margins sharpened; conglutinates white, broken, compressed, leak-like; glochidia average 0.180 x 0.190mm., semi-elliptical, ventral margin rounded, spineless, medium size, hinge line undulate.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell roughly pentagonal, alated, deeply furrowed between dorsal and post-umbonal ridges to emarginated post-dorsal portion; shallow radial furrow just in front of coarsely tuberculated and prominent post-umbonal ridge; disk with smaller, tear-like tubercles scattered all over; beaks rather apiculated, sculptured by coarse corrugations extending out on disk; epidermis brownish yellow, pointed by irregular, downward pointing, green, chevron-like splotches.

INTERNAL STRUCTURES:—Cardinals doubled in both valves; laterals also doubled, right faintly so; beak cavities deep, compressed; nacre pure white to pale pink.

Sex	Length	Height	Diameter	Locality
♀	65	x	60 x 39mm	(Miss. R., Hannibal)
♂	85	x	55 x 36 "	(Meramec R., Fern Glen)
♂	54	x	50 x 25 "	(Osage R., Proctor)
♀	55	x	48 x 30 "	(" " Greenwell Ford)
♀	14	x	11 x 6.5mm	(" " Osceola)

Juvenile shell with three nodulous expansions on post-umbonal ridge, deep furrows between nodules; ligament bright pea green; epidermis straw-color; slopes of dorsal ridge slightly ribbed; beaks high upon dorsal line; posterior peculiarly roundly lipped for the branchial opening.

MISCELLANEOUS REMARKS:—The shell characters of *metanevra*, typical of the whole genus, are highly emphasized. The enormous supra-anal opening and yellow mantle border at the siphonal opening are characteristic of its soft-parts. This species is well represented in Central Missouri and in the Des Moines and Mississippi, but is seldom found in North or South Missouri. The writer has only found it in the Grand River of North Missouri and while he himself has not found it in South Missouri, yet Mr. Walker has it in his collection from Black River, Popular Bluff, Missouri. Simpson (1900b p. 774) reports it for general distribution throughout the Mississippi drainage area except its southern portion, extending to the Tennessee and Arkansas rivers. Its favorite habitat is sandy or gravelly shoals and, as its shell responds to its surroundings, the general form of shell may vary so much as to make it appear as a different species, or sub-species. Its breeding season is found to be tachytictic.

Quadrula metanevra wardii (Lea).

("Monkeyface.")

Not Figured.

1861—*Unio wardii* Lea. Pr. Ac. N. Sci. Phila., V, p. 372; Jl. A. C. N. Sci. Phila., V., p. 187, Pl. XXIV, fig. 257.

ANIMAL CHARACTERS:—Identical with those of its parent species.

SHELL CHARACTERS.

EXTERNAL CHARACTERS:—Shell more elongated than its species, comparatively smooth, heavier, more solid, post-umbonal ridge with an expansion just before reaching basal line; otherwise

its external and internal shell structures are identical with those of *Q. metanevra*.

Sex	Length	Height	Diameter	Locality
♀	86	x 70	x 54mm	(Des Moines R., Dumas)

MISCELLANEOUS REMARKS:—Shells from the type lot, sent to the National Museum and now under the label of variety *wardii* of Lea, and numbered 134,639, are now in the writer's collection through the kindness of the collector, B. F. Bush. However, it is the opinion of the writer that this form may not deserve a name since *metanevra* is subject to so many intergrades due to local conditions. The above comparative description shows its departure not far from type, besides the form is inconstant.

Quadrula cylindrica (Say).

("Razor Handle," "Cob Shell," "Rabbit's Foot,"
"Spectacle Case.")

Pl. XIX, Figs. 52A and B.

1816—*Unio cylindricus* Say. Nich. Ency., II, Pl. IV, fig. 3.

1819—*Unio naviformis* Lamarck, An. Sans., Vert. VI, p. 75.

1900b—*Quadrula cylindrica* (Say) Simpson, Proc. U. S. Nat. Mus., XXII, p. 773.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening moderately large with brownish yellow tentacles; anal finely papillose; supra-anal briefly connected to anal by mantle edge; gills very long and narrow, outer more narrow anteriorly, inner laminae free from visceral mass; palpi long, narrow connected one-third of their length antero-dorsad; color of soft parts peculiar, foot with orange back-ground striped in black, visceral mass uniorange, mantles with black pigment especially along the margins at siphonal openings.

REPRODUCTIVE STRUCTURES:—Only sterile marsupia found, these with normal structures of *Quadrula*. Glochidia unknown.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell rectangular-elongate, length three times the height, dorsal posterior ridge, long, high, slightly costated; wide behind, abruptly rounded before; post-umbonal ridge high, hummocky and pustulate; umbones low, somewhat sharp pointed, incurved, sculptured by corrugated ridges breaking into tubercles out on disk; epidermis dark straw painted (as

in *metanevra*) with green toothed splotches pointed ventrad.

INTERNAL STRUCTURES:—Cardinals double in both valves, serrated and irregular; laterals slightly double and very long; interdentum unusually long; nacre white subject to stain.

Sex	Length	Height	Diameter	Um. ra.	Locality.
♂	105	x 40	x 34	0.190	(White R., Hollister—)
♀	108	x 40	x 39	0.190	(Center Cr., Webb City)
♀	75	x 30	x 28	0.200	(St. Francis, Greenville)
♂	70	x 28	x 26	0.210	(Black R., Williamsville)

MISCELLANEOUS REMARKS;—It is regretted that the description of this interesting species still remains incomplete, from the fact that no juveniles, nor mature individuals bearing ripe glochidia, are found yet. *Cylindrica* is distinctly a southern species and is not found in North or even Central Missouri and is never found in the Mississippi north of the mouth of the Missouri. It is a rather common shell for the White and St. Francis Rivers and from deposits of shells in Indian graves it has been found to be abundant in the streams of Southwest Missouri where it is now extinct. Perhaps the identity of *cylindrica* is one of the most evident because of its unique shell and yet it may well be described as an extremely elongated *Q. metanevra*. The breeding record kept by the writer is early embryos August 14 and sterile maruspia August 29; Wilson and Clark (1911, p. 42) record its gravidity for June 17 and July 27 but do not indicate the embryonic stages.

Genus *Rotundaria* Rafinesque.

(Type *Obliquaria* [*Rotundaria*] *tuberculata* Rafinesque.)

1820—*Rotundaria* Rafinesque, Monograph of Bivalve Shells of River Ohio, Ann. Gen. Sci. Phys. Brux.

1900b—*Rotundaria* (Raf.) Simpson, Proc. U. S. Nat. Mus., XXII, p. 794 (as subgenus)

ANIMAL CHARACTERS:—Siphonal openings peculiar in possessing no true supra-anal openings; gills short wide, inner much wider centrally, inner laminae free from visceral mass; palpi connected about two-thirds of their length antero-dorsad, acuminate postero-ventrad; only outer gills marsupial water tubes more crowded than in non-marsupial gills when gravid marsupia not much distended length-wise through center, ventral edge pointed; conglutinates white, broken, rather narrowly leaf-like, or lanceolate; glochidia semi-elliptical, spineless, large, hinge line short and undulate.

SHELL CHARACTERS:—Shell rotund, disk sculptured for two-thirds of posterior part with irregularly placed tubercles, slopes of post-dorsal ridge regularly costated, some costae somewhat parallel to umbonal ridge behind; beaks well placed anteriorly, sculptured profusely with concentrically zigzag lines across two obliquely posterior ridges being coarser in the valley between; nacre purple; cardinals heavy, double in left, more inclined to be single in right; beak cavities deep antero-postero, narrow diametrically, wide vertically.

MISCELLANEOUS REMARKS:—This genus is unique for its absence of supra-anal opening, for its limitation of marsupia to the outer gills and for its peculiar shell structure in the presence of a well developed sulcus at the post-dorsal part and in its remarkable beak sculpture. The two species of this Genus are most typically represented in the Mississippi of this State, but are found to be more intermediate in form for Central and South Missouri. In the Gasconade and Osage basins these forms grade into those that may be referred to *Plethobasus cooperianus* as far as shell structure is concerned.

Rotundaria tuberculata (Rafinesque).

("Purple Warty Back," "Red Nigger Head.")

Pl. XIX, Figs. 54 A and B; Pl. I, Figs. 1—4.

1820—*Obliquaria (Rotundaria) tuberculata* Rafinesque, Ann. Gen. Sc. Brux., V., p. 103.

1898—*Quadrula verrucosa* Baker, Moll, Chicago, Pt. I, p. 85, pl. XXIII.

1900b—*Quadrula tuberculata* Simpson, Proc. U. S. Nat. Mus., XXII, p. 795.

1912b—*Rotundaria tuberculata* (Raf.) Ortmann, An. Car. Mus., VIII, pp. 258—259.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening very large with few short simple papillae; anal as large as branchial with still shorter papillae; rectum large, visible, anus slightly tentacled; gills wide, short, tilted at abrupt angle, inner much wider, inner laminae free from visceral mass; palpi connected over half of their length antero-dorsad, pointed postero-ventrad; soft parts dingy white, for most part, gills dark brown black posteriorly, foot dark tan.

REPRODUCTIVE STRUCTURES: Only outer gills marsupial,

septa closely crowded, when charged distended very little even in median-longitudinal line, ventral edge not blunt, ovisacs rather narrow; conglutinates white, narrowly lanceolate, not solid; *glochidia large, spineless, ventral margin rounded, hinge line short, straight, or nearly so, measures 0.267 x 0.325mm.*, collected by author, Aug. 11, 1913, Osage River, Bagnell, Missouri.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell oval quadrate, medium in size, compressed, heavy, thick, rounded in front, usually emarginated post-dorsad with radial furrow from this sulcation to beaks, dorsal ridge rather high with upcurved costae; post-umbonal ridge rather rounded; posterior half of shell profusely sculptured with coarse pustules and fine tubercles; umbones low, pitched considerable anteriorly, sculptured with numerous, heavy, wavy or corrugated ridges which extend down on upper part of disk; epidermis brownish red to black.

INTERNAL STRUCTURES:—Cardinals double in left, rather tripartite in right valve; laterals double in both valves, lower right lateral rudimentary, scars deep; beak cavities very deep antero-postero, narrow diametrically, wide vertically, nacre rich purple, with part within the mantle line a lighter shade, sometimes whole nacreous surface faded to whitish with pinkish teeth.

Sex	Length	Height	Diameter	U. ra.	Locality.
♀	80 x	60 x	37mm	0.120	(Meramec R., Fern Glen)
♂	64 x	54 x	27 "	0.135	(Gasconade R., Gascondy)
♀	63 x	62 x	33 "	0.128	(Osage R., Schell City)

The last measurement is that of the smallest juvenile out of a collection of 156 collected in a space twenty-feet square in the White River. This place was a quiet retreat of shallow water with a thin coating of mud over a substratum of limestone.

MISCELLANEOUS REMARKS:—The peculiar shell characters of this species in being suborbicular, heavy, with low corrugated beaks and the unique anatomical characters in possessing no supra-anal opening and only outer gills as marsupial are features especially to be noted. Its distribution in this state is peculiar in that it is not found at all in the interior northern drainage of the Mississippi River, and is confined in its typical form more in the drainage of the south slope of the Ozarks and in the Missouri portion of the Mississippi while it occurs by intergrades in the

southern drainage of the Missouri River. Simpson reports it for the Mississippi drainage generally. A three hundred mile survey of the Osage River, beginning at the headwaters, reveals the shell of this species in all its external form and nacre-color extending to *granifera* and even including *Pleth. cooperianus*. Variation in nacre-color for this species is remarkable; however, this deviation from the unipurple nacre of the type may be due to local reaction since it is most noticed in the Osage below the region of medicinal springs. Its favorable habitat is that of rocky shoals, but is occasionally found in deep, quiet water with mud bottom where it acquires a smoother, heavier and less inflated shell. The writer has had the good fortune to secure, *for the first time, several individuals gravid with mature glochidia*. The larva is found to be somewhat smaller than that of *R. granifera* and with hinge line shorter and straighter; as to form, and even as to size, it is hardly distinguishable from *granifera* when allowance is made for variation in a large series. This glochidium is *figured and described here for the first time* (See Plate I, Fig. 4). It is observed by the writer to be gravid from June until the middle of August, bearing ripe glochidia mostly about the middle of July. It is decidedly a short period breeder.

(To be continued.)

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—I.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—I.

With Notes by J. Lunell.

INTRODUCTORY.

The statements and data furnished in the following series of papers are derived substantially from a twofold origin: (1) *My own herbarium*, a part of which contains the visible results of my wanderings in this state during the years of 1889 to 1914 (except 1897 and 1903, when field work in the state of Oregon and in Europe attracted my exclusive attention); and (2) *My Panama-Pacific Exposition Herbarium of North Dakota*, which contains a rich supply of its own habitational informations, and

whose title and origin therefore no doubt deserve a brief explanatory mention here, especially as it never was sent to said exposition.

In December 1912 I was requested by Gov. Burke's Panama-Pacific Commission to appear before it on a certain evening in the city of Grand Forks. The commission expressed as its opinion that a representation of the natural plant wealth of the state would constitute an excellent exhibit, and decided unanimously to recommend me to be trusted with the creation of such an exhibit. In my reply of acceptance, I promised that the best duplicates in my exchange herbarium would be available for this purpose, and that I, in order to fill existing vacancies in said herbarium and increase the value and completeness of the exhibit would during the green seasons of 1913 and 1914 visit suitable localities within the state, where I knew the required plants were growing. Also a sum as remuneration for my expenses and services was fixed. My work was commenced immediately and continued without interruption almost until January 1915.

After a short life of a few weeks the commission expired and was supplanted by another one of republican denomination. This commission ought to have taken into consideration that I was working in good faith and would continue so until advised to the contrary. If there was any chance for alteration or overturn of the recommendation made by the first commission, the new body ought to have forewarned me early, in order to save me from futile investments of time, work and funds. But it kept an obstinate silence until I had finished my object—a task of two years' duration—and then decided to ignore the recommendation made by its predecessor. My exhibit was not industrial, no dollar-maker, but it had been originated by no action, no scheme of mine, and it possessed a permanent value, far above the ephemeral ones illustrative of the majority of exhibits prevalent at fairs of this brand.

In 1900, under the auspices of the North Dakota Agricultural College was published: "A Preliminary List of the Spermatophyta, Seed-bearing Plants of North Dakota, by H. L. Bolley and L. R. Waldron," containing 775 species and varieties. A revision of this list, called: "Check List of North Dakota Plants, Ferns and Flowering Plants, North Dakota Agricultural College Herbarium, Bolley and Bergman, compiled by G. F. Bergman (after Britton's Manual)," not dated, appeared I believe in 1913. To the number

of species and varieties, contained in the first list, had been added 187, making a total of 962. The present list of mine, being the third of its kind, contains about 1150 numbers, some 800 of which are found in the two previous lists, being an addition of 350 numbers not listed before, and raising the total number for this state discovered until the present time (May 1915) to at least 1300. My field of work has been mainly the Lake region, this being without contradiction or doubt the most important and the most prolific part of the state botanically, all the new forms whatever of plant life (with one or two exceptions), which have been found within the state, belonging here. A moderate, conservative estimate would raise this present number of 1300 up to the two thousand, even now, since the "improvement" work has gone on recklessly for many years. When I, 26 years ago, commenced my collecting in this state, it must have been considerably higher than now, to deem from the number of species believed to be extinct.

It would hardly be recommendable to delay the publishing of these papers until the names of those supposed-to-be-700 plants could be added. It is fain to predict that this number will never be reached. Too much ground has been ploughed, the beautiful natural groves have been transformed into pastures and hog pens, the fast evaporation from the areas laid open, and the quick absorption by the latter of rain and melting snow leave no surplus to be drained off into the sloughs and the coulées, these are almost all dry, even in the early spring, lakes a few years ago covering square miles have vanished, and our largest water main, Devils Lake, is disappearing fast. The semi-aridity of the country seems to be increased in direct proportion to the breaking of the virgin prairies. Still, a paternal legislature, in spite of the steadily growing difficulties in providing means for paying the regular budget, has just seen fit to vote \$60,000 for the promotion of immigration, and the likely-to-be-added population will in all probability direct its first efforts to the quick overturning of the remaining intact portion of the prairie. Of all menaces to the continued propagation of the native flora this change in soil conditions is the worst, the most destructive.

And these 700 plants can not be found without the co-operation of collectors. The federal government furnished botanists when surveying the country, and got up a representation of the

common plants growing everywhere, but it is self-evident that almost all the rare plants—the plants which are found after visits to a place repeated for the tenth, or the hundredth, or perhaps the thousandth time—could not be noticed in the collected material. The government's activity ends here, and would certainly not be extended to taking any part in the collection of the 700 plants.

Turning our attention to the large public or private institutions, some of them, often commanding almost unlimited funds, are in the habit—when it is desired to make a study of some special plant or plant group—of sending circulars to botanists, requesting them to “give up” what they have on hand or to collect the desired plants for them. In the majority of cases the botanist so addressed will “for the best interests of science” yield, and some will even find the proposition immensely flattering to themselves! There are perhaps a few who would say that they are willing to fulfil the request, if the institution pays the cash expenses necessarily connected with it, but such a proviso will upset the whole plan. It is deemed unwise to use the funds of the institution for such a purpose (why pay for something that can be had for the asking?), and the scheme is dropped. Some institutions make their requests for material most valuable to them with “thanks,” others do not even send an acknowledgement when they have received the goods. The most generous of the institutions return duplicates of equal or sometimes higher quality than the material received had, others use the occasion to unload the most repugnant and worthless trash, others again admit being in debt and promise payments in plant duplicates, but these are never sent. Still others pay their indebtedness by incorporating and matriculating the received specimens as gifts, and immortalize the donator by adding his name in a special column and opposite the other annotations, thus substituting stones for bread! Some other more substantial means are certainly needed for the discovery of our 700 plants!

It remains to be ascertained, if the conditions within our own state are more favorable for the reaching of this end. The state has a geological survey with a staff botanist, whose salary is supposed to be reimbursed to the farmers by the increase in profits from their land derived from the knowledge of the plants growing on it in its virgin condition. The reports of the government survey ought to be available, and some additional knowl-

edge can certainly be expected from a second survey, but its scope is confined to the common plants. Almost all of the rare plants will remain undiscovered. The place needing weekly visits for years can not reveal its secrets on the very day when the surveyor scans it. When writing this I have before me Public Document No. 45 with a report of a survey from Williams County. This gives 236 as a total of plants found. There is no doubt in my mind that at least twice this number could easily be collected within the area, and at the same time that there is no neglect on the part of the botanist. Wherever he went, he certainly collected all there was to collect. Another striking fact is, that out of these 236 species all but 23 (*i. e.*, 90 per cent) are common plants in my home corner, 200 miles to the east of Williams County, and to an overwhelmingly large extent probably in almost all the other parts of the state. A home botanist with an ordinary imagination would no doubt be able to make out a correct list of plants growing inside of any county not visited by him, with the exception of the rare or comparatively rare plants, of course. I would predict, that a majority of the 700 undiscovered plants would remain hidden for 100 years to the botanist-surveyor! I have learned, that this survey has not been at work recently.

It is surprising to me that so few people of means turn their attentions to the accumulation of botanical objects with their unlimited multiplicity, in place of storing buttons, canes, smoking pipes, stamps, etc. There are few things if any, so beautiful, so fascinating as an artfully preserved herbarium plant. To the true botanist the joy of collecting surpasses all other joys. The rich man can use his time as he pleases and could easily amass in one year a plant wealth larger than another mortal could accumulate in a lifetime. Is there any prospect that it would arise in this state a rich man turning his mind to the wild-flowers and taking up the task of trying to find those 700 plants unrevealed yet to all?

At the present there is, if I am not incorrectly informed, no field work done within the state, except by Prof. O. A. Stevens, representing the Agricultural College, by Dr. J. F. Brenckle of Kulm, N. Dak., whose excellent work in mycology, made public in his *Fungi Dakotenses*, can not be overestimated, and by the writer. Prof. Stevens, having enjoyed the liberty of choosing

his own places for field research, has had some striking and even astonishing results. My good fortune has always guided me to find places of exceptional value to the botanist. During my wanderings I have often happened on plants, either immature or overripe, the proper time for their collection being so far in the past or in the future, that their places in the system could not be properly set down. They are scattered widely apart in the state, and each of them needs its individual attention on a certain date of the season, and on a certain place. I am loth to leave them alone, and I would not do so, were it not for more or less apparent reasons, hinted at in these pages or readable between the lines. The summers yet allotted to me on this planet of ours would perhaps give me enough of time for finishing this work, and I would spend them on nothing in the world more agreeable and more preferable to myself.

Dr. Brenckle necessarily paying almost his entire attention to fungi, I myself being on the verge of actual or partial or fancied retirement from botanical field work, and Prof. Stevens likely alone upholding this branch of study within the state, what are the present prospects for the discovery of those remaining 700 vascular plants? If it becomes possible for Prof. Stevens to avoid the lurking rocks of politics and continue the work incessantly for a life time, he will certainly discover a considerable part of them.

Thus, being temperamentally not oversanguinely hopeful, I believe that the most prudent way is to distrust the uncertain future and publish the results attained so far.

My list contains mainly names of plants collected by myself, and where other botanists have contributed, they have been invariably credited for it. About 150 species, contained in the Agricultural College lists, have been omitted for the sole reason, that I have had no occasion to look at them. I do by no means charge that they have been wrongly identified.

In the naming of plants which I have considered new I had precious help from my own general herbarium, which offered means of comparison with related species. In a minority of cases the descriptions furnished in manuals and periodicals proffered reasons for segregation sufficient and convincing at least to myself. In a number of instances it has been my enviable luck that Dr. Edw. L. Greene placed his immense experience and invaluable

advice at my disposal. The changes from the nomenclature hitherto in vogue, the administering of justice botanically, the meting out of his due to everybody have, with the kind consent of Prof. J. A. Nieuwland, been submitted to and supervised and worked out by him, and for the sake of convenience, where the new name differs materially from the one hitherto used, this last has been parenthetically affixed. For the expert identification of a majority of *Cyperaceae* I am under obligation to Mr. K. K. Mackenzie. Likewise it has become a fixed habit of mine to submit a considerable part of my grasses to Prof. A. S. Hitchcock and Mrs. Agnes Chase for determination, from which there is no appeal, as no one would question their finality.

No criticism in this preface shall apply to the brother-botanist who pays his own botanical expenses out of his salary or his private purse. Nothing is too good for him. His wishes are so many laws to me, and I will gladly and without material remuneration extend to him all the help I can, in order to make his road smooth and facilitate his researches.

Any previous names of North Dakota plants for which I am responsible, being not mentioned in this list, and any of my descriptions pertaining to North Dakota plants, being not in conformity with those given in these papers, are herewith repealed.

If some one should conclude that a mind saturated with bitterness and "gall" has dictated these lines and exaggerated this quite gloomy review of existing conditions botanically, he commits himself to a grave error. I have just tried to relate undisfigured facts, with a mind overflowing of tenderness and good will towards all.

Subkingdom PTERIDOPHYTA.

Order I. DORSIFERAE. Rivinus (1690-1699).

Family 1. OPHIOGLOSSACEAE Presl. Pterid. 6. (1836).
BOTRYCHIUM Swartz, Schrad. Bot. 2: 8, (1808).

1. *Botrychium virginianum* (Linn.) Swartz. Schrad. Bot 2: 111, (1800).

Turtle Mountains: St. John, Dunsieith; Fort Totten. (Bergman).

Family 2. POLYPODIACEAE R. Brown, Prod. Fl. Nov Holl. 1: 145, (1810).

WOODSIA R. Br. Trans. Linn. Soc. 11: 170, (1812)

2. *Woodsia obtusa* (Spreng.) Torr. Cat. Pl. in Geol. Rep. N. Y. 195, (1840).
Dickinson (Cl. Waldron).
3. *Woodsia oregana* D. C. Eaton. Can. Nat. 2:90 (1865).
Morton Co.: Coffin Butte (Bell).
CYSTOPTERIS Bernh. Schrad. Neues Journ. Bot., I. pt. 2: 26, (1806).
4. *Cystopteris fragilis* (Linn. 1762) Bernh. Schrad. Neues Journ. Bot. 1. c. 27, (1806).
In the western part of the State.
Family 3. **MARSILEACEAE** R. Brown. Prod. Fl. Nov. Holl. I:166, (1810).
MARSILEA Linn. Sp. Pl. 1099. (1753).
5. *Marsilea mucronata* A. Br. Amer. Journ. Sci. (II.) 3:55, (1847).
Leeds (extinct); Butte (extinct).
6. *Marsilea oligospora* L. N. Good. Bot. Gaz. 33:66, (1902).
La Moure Co.: Edgeley (Cl. Waldron).
Family 4. **EQUISETACEAE** Mich. Fl. Bor. Am. 2:281, (1803)
EQUISETUM Plinius 1, 26, C. B.
7. *Equisetum arvense* (C. Bauhin) Linn. Sp. Pl. p. 1061, (1753).
Across the state.
8. *Equisetum fluviatile* Linn. Sp. Pl. 1062, (1753).
Leeds, Pleasant Lake.
9. *Equisetum fluviatile limosum* Linn. Sp. Pl. 1062 (1753).
Leeds, Towner, Pleasant Lake.
10. *Equisetum hiemale* var. *affine* (Engelm.) A. A. Eaton
in Fern. Bull. XI. 75, 111 (1903).
Leeds, Butte.
11. *Equisetum hiemale* var. *intermedium* A. A. Eaton
Fern Bull. X., 120. (1902), XI., 108., (1903).
Leeds, Butte; McHenry Co.: Towner, Sand Hills.
12. *Equisetum hiemale* f. *polystachyon* Prayer in Gilbert,
List N. A. Pterid, 8, 26, (1901).
Benson Co. Comstock.
13. *Equisetum hiemale* var. *pumilum* A. A. Eaton, Fern.
Bull. XI. 75, 111 (1903).
Leeds.
14. *Equisetum hiemale* f. *ramigerum* A. Br. in Gilbert,

List N. A. Pterid, 26, (1901). See also A. A. Eaton in Fern Bull. XI., 112, (1903).

Eddy Co., Sheyenne.

15. *Equisetum robustum* A. Br. Engelm. Am. Journ. Sci. 46: 88, (1844).

In the Willow Creek ravine near Dunsieith.

16. *Equisetum pratense* Ehrh. Hannov. Mag. 138, (1784).
Turtle Mountains: near St. John; Pleasant Lake.

Family 5. **SELAGINELLACEAE** Underw. Nat. Ferns, 103, (1881).

SELAGINELLA Beauv. Prod. Aeth. p. 101, (1805).

17. *Selaginella densa* Rydberg. Mem. N. Y. Bot. Gard, I:7, (1900).

Dunsieith, Towner, Minot.

Subkingdom SPERMATOPHYTA.

Class I. GYMNOSPERMAE.

Order I. **CONIFERAE**. Bellonius (1533), Rivinus (1690-1699).

Family 6. **ABIETIDEAE** S. F. Gray, Nat. Arr. 2, 223, (1821).
PINUS Virgilius, Ecl. VII. 56 and Georgica I, 141.

18. *Pinus scopulorum* (Engelm.) Lemmon. Gard. and For. 183, (1897).

Medora (Bergman.)

JUNIPERUS Virgilius Ecl. VII, 53, and Ecl. X. 78.

19. *Juniperus vulgaris* Tragus. Hist. 1074, also Clusius (1601).

Juniperus communis Linn. Sp. Pl. 1040 (1753).

Medora (Bergman).

20. *Juniperus depressa* Raf. Med. Fl. 12, (1830).

Juniperus prostrata Pers. (?).

Dickinson (Bergman).

21. *Juniperus scopulorum* Sargent. Gard. and For. 10423, (1897).

Medora (Bergman in 1910; Stevens in 1914).

Class 2. ANGIOSPERMAE.

Subclass 1. **MONOCOTYLEDONEAE**. J. Ray and A. Haller.

Order 6. **PANDANALES**.

Britton, Man. 2nd ed. p. 38. (1905).

Family 7. **TYPHACEAE** J. S. Hillaire, Expos. Fam. 1, 60 (1805).

TYPHA Theophrastus. Hist. Pl. 4, 11, Dioscorides 3, 123. Plinius, Nat. Hist. 16, 36 and 66, also 19, 2.

22. *Typha palustris* Ruellius Nat. Stirp. p. 560, (1543).

Typha latifolia Linn. Sp. Pl. p. 971 (1753).

Leeds.

Family 8. **SPARGANIACEAE** Agardh, Theor. Syst. Pl 13, (1858).

SPARGANIUM Dioscorides 4, 21.

23. *Sparganium eurycarpum* Engelm. in A. Gray, Man. 2nd. Ed., p. 430, (1836).

Borders of Lake Ibsen (extinct on account of drought); Leeds (a few plants in a roadside ditch).

Order 7. HELOBIAE. Bartling, Ord. Nat. p. 70, (1830).

Family 9. **POTAMOGETONEAE** Dumortier, B. C. Flor. Belg. Stam. p. 163, (1827).

24. *Spirillus foliosus* (Raf.) Lunell.

Potamogeton foliosus Raf. Med. Rep. (II.) 5: 354, (1808).

Jamestown (Bergman).

25. *Spirillus Friesii* (Ruprecht) Nwd. Am. Midl. Nat. Vol. III., p. 17 (1913).

Potamogeton Friesii Rupr. Beitr. Pf. Russ. Reichs, 4, p. 43, (1845).

In Lake Ibsen (extinct); Jamestown, in James River.

26. *Spirillus heterophyllus* (Schreb.) Nwd. Am. Midl. Nat. 1. c. p. 17, (1913).

Potamogeton heterophyllus Schreb. Spicil. Fl. Lips. p. 21, (1771).

Leeds.

27. *Spirillus natans* (Linn.) Nwd. Am. Midl. Nat. 1. c. p. 16, (1913).

Potamogeton natans Linn. Pan. Succ. Am. Acad. II. p. 241, (1749), Sp. Pl. p. 126, (1753).

Wahpeton (Bergman).

28. *Spirillus pectiniformis* (Linn.) Nwd. Am. Midl. Nat. 1. c. p. 18, (1913).

Potamogeton pectiniforme Linn. Am. Acad. II., p. 241, (1749). *Potamogeton pectinatus* Linn. Sp. Pl. p. 127, (1753).

Leeds, Lake Ibsen, Devils Lake.—Kulm (Brenckle).

29. *Spirillus perfoliatus* (Linn.) Nwd. Am. Midl. Nat. 1. c. p. 17, (1913).

Potamogeton perfoliatus Linn. Am. Acad. II., p. 241, (1749),
Sp. Pl. p. 126, (1753).

Leeds.

30. *Spirillus perfoliatus* var. *Richardsonii* (A. Bennett)
Nwd. Am. Midl. Nat. 1, c. p. 17 (1913).

Potamogeton perfoliatus v. *Richardsonii* A. Bennett.

Leeds. Kulm (Brenckle).

31. *Spirillus Zosteraefolius* (Shum) Nwd. Am. Midl. Nat.
1. c. p. 17, (1913).

Potamogeton zosteraefolius Shum. Enum. Pl. Saell. p. 50, (1801)
Lake Ibsen (extinct).

BUCCAFERREA Micheli. Nov. Pl. Gen. 72 (1729).

32. *Buccaferrea maritima* (Linn.) Lunell.

Ruppia maritima Linn. Sp. Pl. p. 127 (1753).

In Devils Lake. This was supposed to be the only vascular
plant existing in said lake, but the writer found in 1913 *Spirillus*
pectiniformis growing in company with the *Buccaferreae*.

ALGOIDES Vail. A. I. t. 11. 1, (1719).

Aponogeton Pontedera, Anthologia II., 117 (1720).

Zannichellia Micheli. Nov. Pl. Gen. 71, (1729).

33. *Algoides palustre* (Linn.) Lunell.

Zannichellia palustris Linn. Sp. Pl. p. 127. (1753).

Butte, York, Devils Lake.

Family 10. **JUNCAGINEAE** Rich. also Kunth, Endlicher,
(1840).

TRIGLOCHIN C. Bauhin Pinax. p. 6, (1623).

34. *Triglochin tricapsularis* Linn. Am. Acad. p. 245, (1894).

Triglochin palustris Linn. Sp. Pl. p. 338, (1753).

Butte, Towner.

HEXAGLOCHIN (Dum.) Nwd. Nov. Gen. Am. Mid. Nat.
Vol. III., p. 19, (1913).

35. *Hexaglochin sexocularis* (Linn.) Nwd. Am. Midl. Nat. 1.c.

Triglochin maritima Linn. Sp. Pl. p. 339, (1753).

Leeds, Thorne, Towner.

Family 11. **ALISMACEAE** D. C. Fl. Fr. 3, p. 181, (1805).

ALISMA (Plinius), Nat. Hist. 1. 25, c 10 et 77, Valerius
Cordus (1561).

36. *Alisma Geyeri lanceolatum* (Buchenau) Lunell. Bull.
Leeds Herb. 2: p. 5, (1908).

Alisma arcuatum lanceolatum (Buchenau) Lunell, Bot. Gaz. 43, p. 211, (1907).

Alisma Plantago (aquatica) *arcuatum lanceolatum* Buch. in Engler, Pflanzenreich IV. 15, p. 14, (1903).

Leeds, Butte.

37. *Alisma Geyeri pumilum* (Prahl) Lunell.

Alisma arcuatum pumilum Prahl in Kritische Flora 2: 204, (1890).

Alisma Plantago (aquatica) var. *pumilum* Nolte in Sched.; Sonder, Flor. Hamb. 210, (1851).

Rare. Bottineau along Oak Creek, Leeds.

38. *Alisma Geyeri angustissimum* (Aschers. et Graebn.) Lunell, Bull. Leeds Herb, 2: p. 5, (1908).

Alisma arcuatum angustissimum (Aschers. et Graebn.) Lunell, Bot. Gaz. 43, p. 211, (1907).

Alisma Plantago (aquatica) *arcuatum angustissimum*. Aschers, et Graebn. Synops, Mitteleur, Flora 384, (1898).

Leeds, York.

39. *Alisma Geyeri giganteum* Lunell, var. nov.

Phyllodia 5-7 mm. lata, linearia, phyllodiis varietatis praeedentis duplo longiora. Ubi superficiem rivuli attingunt, extremitates in folia lanceolata, 6-10 cm. longa, 1 cm. lata transmutantur.

Phyllodia 5-7 mm. wide, linear, twice as long as in the preceding variety. There exists in the phyllodia a strong tendency, a tendency to get to the surface of the water, to reach "a place in the sun," and if they succeed, their ends become leaves, lanceolate, 6-10 cm. long and 1 cm. wide.

A large plant, rare. Collected by the writer on July 18, 1906 in running water at Leeds. Extinct in the type locality.

40. *Alisma subcordatum* Rafinesque, in the Medical Repository, Hexade 2, vol. 5, p. 362, (1808).

Alisma Plantago (aquatica) Linn., var. *Michaletii* Aschers, et Graebn., f. *latifolium* Aschers. et Graebn. Synops. Mitteleur. Flora I, 383 (1898), and Bot. Gaz. 43, p. 210 (1907), in part.

We quote from the description of Rafinesque: "—radical leaves petioled, semi-cordate, very obtuse, flowers in a very loose panicle, verticillated by threes. Common almost all over the United States of America, where it is mistaken for the *Alisma plantago* of Europe, which is widely different, having quite lanceolated leaves, very acute."

Both species have flowers 4-8 mm. in diam., or petals 2-4 mm. in length. The *A. plantago*, thus described is common on the European continent, but the writer collected in 1897 on an island in the Baltic Sea a specimen, which can not be differentiated from *A. subcordatum*, having broadly ovate, semi-cordate, obtuse leaves. This leaf form is the same in

41. ***Alisma subcordatum superbum*** Lunell.

Alisma superbum Lunell in Bull. Leeds. Herb. 2: p. 5, (1908), but its flowers are larger, 1-1.2 cm. in diam., petals 5-6 mm. in length.

42. ***Alisma subcordatum stenophyllum*** (Aschers. et Graebn.) Lunell.

Alisma Plantago (aquatica) Linn. var. *Michaletii* Aschers. et Graebn., f. *stenophyllum* Aschers. et Graebn. l. c. 383, and Bot. Gaz. 43, p. 210 (1907), in part.

Has flowers of the same size as the species, but the leaves are lanceolate.

The varieties of *A. subcordatum* are found merely occasionally, but the species is abundant in wet soil throughout the state.

SAGITTARIA Plinius, Nat. Hist. I: 21, c 17 and 68.

43. ***Sagittaria arifolia monomorpha*** Lunell in Bull. Leeds Herb. 1, p. 2, (1907).

Leeds.

4. ***Sagittaria arifolia stricta*** J. E. Smith, Rep. Mo. Bot. Gard. VI. (1894) 8 t. 1.

Occasionally found at Leeds.

45. ***Sagittaria arifolia dimorpha*** Lunell in Bull. Leeds Herb. 1, p. 3, (1907).

Leeds.

46. ***Sagittaria arifolia polymorpha*** Lunell in Bull. Leeds Herb. 1, p. 3, (1907).

Leeds.

Natural conditions have so far almost entirely prevented the reappearance of this and the following varieties since the year when I published them (1907).

47. ***Sagittaria arifolia cuneata*** (Sheldon) Lunell, in Bull. Leeds Herb. 1, p. 3, (1907).

Sagittaria cuneata Sheldon, Bull. Torr. Bot. Club, 20: 283, pl. 159, (1893).

Leeds.

- Family 12. **VALLISNERIACEAE** Dumortier Anal. Fam. p.
54, (1829).
PHILOTRIA Raf. Am. Month. Mag. 2, p. 175, (1818).
48. *Philotria canadensis* (Michx.) Britton. Sc. II., 2, p.
15, (1895).
Minot, Jamestown.
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OUR BIRDS IN THE WINTER OF 1913-14.

BROTHER ALPHONSUS, C. S. C.

This winter the total number of species exceeded that of the previous one by two species. The totals of each of the months were also larger than those of last winter.—December having 5 more; January, 7 more; February, 5 more. The Cardinal, Meadowlark, Bronzed Grackle, Goldfinch and Screech Owl were not seen last winter; while the Northern Shrike and Herring Gull did not appear this winter.

The weather conditions this year were favorable most of the winter, and to this was due the presence of certain species that had never been recorded before in winter. These were the Meadowlark and Bronzed Grackle. Only for a short time—in early February—the temperature fell below zero, that month having had the smallest number of species.

The Crow had 22 records for December, with the longest interval, 6 days. In January there were 20 observations, the longest absence having been 4 days. February shows the largest record for the species—26 days present, and 3 days, the greatest interval. For the three months the total number of records was 68.

The Blue Jay was found on 25 days in December, with an absence of only one day at any time during the month. The January records reached 26, with the same absence as in December. The cold of February reduced the records of the Jay to 22, with 3 days as the longest interval. The total for the three months was 73 records, the largest number of any species this winter.

This is the first winter I have found the Red-headed Woodpecker as a resident species. Just what caused the bird not to migrate may not be easy to determine. Weather conditions may have had something to do with its staying, as is shown by the

difference in the records during the coldest part of the winter—in February. That month had only 15 records, while in December there were 26, and in January 25, making a total of 66.

These Woodpeckers confine themselves, in winter, entirely to oak groves, where they fly about, mostly in the morning. The range of their utterance is very limited, and frequently their presence would not be noted unless this utterance was heard. Both the old birds and their young are indistinguishable in winter.

The White-breasted Nuthatch was fairly conspicuous both in December and January, the former month totalling 21 and the latter 19 records. In February there was a marked falling off—only on ten days was the bird seen. Although there was a scarcity of the species in February, yet no longer interval than 4 days indicates there was no winter migration this season. For the three months, there was a total of 50 records.

The Downy Woodpecker was seen 15 times in December, with a long absence between the first and twelfth of the month. In January the species had its smallest record for the winter—12 observations; with the greatest interval, 4 days. The February records amounted to 14, and the longest absence was 3 days. The total for the entire month reached 41 records, exceeding the winter before by 27 records.

The Tree Sparrow had its highest record in December—18; with the greatest interval, 4 days. January shows 12 observations and 6 days as the longest absence. February had but 4 records, and a long period of 20 days during which the species must have migrated. The total for the winter was 34 records. This was the largest number of observations, in winter, that I ever made for the Tree Sparrow. Last year this season shows only 6 records, and none at all in December.

The Snowbird was quite evenly distributed this winter, December having 16 records; January, 15; Feb. 14; and the total was 45. In December the longest interval was 3 days; in January 15 days; in February 2 days. The total number of days absent was equal to the total number of days present. The record compared with previous winters is phenomenal, for in four other winters the total was only 60 records.

The Chickadee was unevenly distributed, December showing 12 records; January 5; and February 7; with a total of 24

Compared with the winter before, this total was remarkable; for in that season there were no records for January and February, and only 5 for December. It would be difficult to assign the cause of such great disparity in distribution, both between parts of one winter, and between two successive winters.

The rare species seen this winter were: Goldfinch, Song Sparrow, Brown Creeper and Snowflake. The Goldfinch had 7 records in December, 2 in January, and none in February. This species was not observed last winter. The Song Sparrow had 4 records both in December and in January, and 2 in February. The Song Sparrow was seen only once last winter—in December. The Brown Creeper shows 6 records both in December and January, and one in February. Last winter this species was found twice in December and once in February; there was no record for January. The Snowflake did not appear in December, and the first observation was made on January 31. February, between the 2nd and 24th, had 9 records, the greatest interval being 5 days.

Very rare species this winter were: Bronzed Grackle, Screech Owl, Meadowlark, Hairy Woodpecker and Cardinal. The Bronzed Grackle had 3 records, only in December. The Screech Owl was heard three times in December and once in January. The Meadowlark reappeared once in December and January. The Hairy Woodpecker and Cardinal each had a single record in January.

DECEMBER.

Crow, 1, 2, 3, 5, 8 to 15, 19, 20, 21, 24 to 27, 29, 30, 31.	Tree Sparrow, 2, 3, 5, 6, 10, 13 to 18, 20, 22 to 25, 27, 30.
Blue Jay, 1, 2, 3, 5, 6, 8, 10 to 15, 17 to 22, 24 to 27, 29, 30, 31.	Snowbird, 2, 3, 5, 8, 9, 10, 13, 16, 17, 20, 21, 22, 24, 25, 29, 30.
White-breasted Nuthatch, 2, 3, 5 to 10, 14 to 19, 21 to 25, 27, 30.	Chickadee, 1, 4, 8, 14 to 17, 20, 21, 25, 27, 29.
Red-headed Woodpecker, 1 to 5, 9 to 15, 17 to 27, 29, 30, 31.	Goldfinch, 1, 4, 5, 8, 11, 13, 25.
Downy Woodpecker, 12 to 15, 18, 20, 21, 23, 24, 25, 27 to 31.	Brown Creeper, 4, 5, 6, 7, 10, 15.
	Song Sparrow, 2, 6, 18, 31.
	Bronzed Grackle, 11, 19, 24
	Screech Owl, 21, 24, 30
	Meadowlark, 1

Total number of species seen, 14.

JANUARY.

Red-headed Woodpecker, 1, 2, 3, 5, 7 to 11, 13 to 24, 26, 27, 28, 30.	Tree Sparrow, 1, 8, 9, 11, 15, 16, 19, 21, 22, 26, 27, 28, 30.
Blue Jay, 2, 3, 5 to 11, 13 to 24, 26, 27, 29, 30, 31.	Downy Woodpecker, 3, 4, 7, 12 to 15, 21, 22, 27, 28, 29.
Crow, 2 to 5, 7, 9, 14 to 17, 19 to 24, 27, 28, 29, 31.	Brown Creeper, 3, 4, 15, 20, 21, 23.
White-breasted Nuthatch, 1 to 4, 7, 8, 9, 13 to 17, 19, 21, 22, 23, 27, 28, 29.	Chickadee, 1, 2, 7, 21, 27.
Snowbird, 1, 7, 9, 11, 12, 15, 16, 17, 19, 21, 22, 23, 27, 28, 29.	Song Sparrow, 5, 8, 20, 27.
	Goldfinch, 8, 27.
	Hairy Woodpecker, 28.
	Screech Owl, 18.
	Meadowlark, 7.
	Cardinal, 27.
	Snowflake, 31.

Total number of species seen, 16.

FEBRUARY.

Crow, 1, 3 to 8, 10 to 28.	White-breasted Nuthatch, 3, 4, 6, 8, 10, 13, 16, 21, 26, 27.
Blue Jay, 1 to 6, 8, 10, 11, 12, 14, 15, 16, 18 to 22, 25 to 28.	Snowflake, 2, 7, 8, 14 to 17, 20, 24.
Red-headed Woodpecker, 2 to 5, 10 to 13, 18, 20, 21, 25 to 28.	Chickadee, 3, 8, 14, 20, 24, 26, 27
Snowbird, 3, 6, 8, 11, 13, 15, 16, 18, 20, 21, 24, 26, 27, 28.	Tree Sparrow, 3, 6, 27, 28.
Downy Woodpecker, 3, 4, 6, 10, 11, 13, 15 to 18, 21, 24, 27.	Song Sparrow, 1, 19.
	Brown Creeper, 6.

Total number of species seen, 11.

Total number of species seen during the winter, 17

MIGRATION OF OUR BIRDS IN THE SPRING OF 1914.

BY BROTHER ALPHONSUS, C. S. . C.

Comparing the March migrants for the present year with those of three previous years, I find that 1914 has the largest number—18. Only in 1910 were there more migrants in March, that month having had 25. The weather that year was exceedingly

warm in March, making the early arrivals among the birds unprecedentedly numerous.

The Song Sparrow's early arrival, on March 5, was duplicated only once in six years—in 1910. Both of these dates occurred in springs that followed mild weather. My observations for the last two years show that this species, in small numbers, remains with us through mild winters. The records of the Song Sparrow made during those seasons were few, and doubtless the regular appearance of the species in March indicates that they were not residents but migrants.

The hardy Meadowlarks seldom arrive north later than March 10, the date of migration for the present year. They have appeared at Notre Dame even in mid-winter, last December and January it being my good fortune to make records of the species. I have also three records, in different years, that are earlier than March 10.

Among the first spring migrants, the Killdeer may be placed with certainty. Six years show that the period of arrival for the species fell within ten days, no date being later than the 14th of the month. Such great regularity in the time of returning is extremely rare among March migrants.

The Purple Finch's early date in March is quite a month ahead of the time of arrival in 1909, and almost a month earlier than in 1911. These years and the present year are the only ones in which the species was recorded. Such great disparity in dates of migration seems inexplicable. But this species is rather locally distributed, and even in a small area it may easily be overlooked by other than careful observers.

The date of arrival for the Bluebird is one of the latest I have recorded—only one other being later. In six years, the migration of this species occurred three times both in February and in March. This would seem to indicate disparity, yet when the two sets of dates are looked at separately, there is not wanting an element of regularity.

Most of the Robin's dates of migration occur in March, there being only one record for February in six years. Among the March dates, the 13th of the present year is very close to two others—March 9 and 14. I have always striven to see the Robin on the first day of its arrival, but when other observers have been

more successful, I have not hesitated to take their date for such a common species as the correct one.

The Red-winged Blackbird's rather late arrival, on March 24, is approached only by one later date—April 2, 1912. The element of locality must always be considered in determining the date of migrants for this species. Swampy lakes attract these blackbirds, and bodies of water whose shores are but slightly marshy may not entice the earliest of the Red-wings. Such are the lakes at Notre Dame, Indiana.

March 25, 1914, is the earliest record I have made for the Sapsucker, March 26, 1910 being the nearest to that date. All the others occurred in April, most of them after the 10th of the month. Like the Bluebird, the Sapsucker shows regularity in the respective sets for March and April, and disparity between them.

The Kingfisher made one of its best records this year, arriving on the 27th—5 days later than the earliest date. Looking over my records for this species in six years, I find that four of them are in March and two in April. When the winters are not severe, the Kingfisher always arrives in March.

Accumulating records of the Mourning Dove show that this species seldom arrives after March. So far there are five records for that month, and but one for April—the 3rd. The Dove was first found this spring on March 30—the latest date for that month.

The Phoebe also made its latest record March this year, arriving on the last day of the month. Three of the other dates are in March, and two in April—on the 2nd and 3rd. These records make the Phoebe a close competitor with the Mourning Dove.

Like the Phoebe, the Cowbird was one of the latest of the March migrants this year. But unlike that species, this blackbird has its records for six years distributed equally in March and April. In the latter month, the dates all fall within the first week, but in March they cover nearly half of the month—the earliest being on the 16th.

The number of April migrants in 1914 equalled those of the same month in 1913, these two years having the highest records in six years. Although both in 1913 and 1914 the springs followed mild winters, yet the migrants exceeded those of April 1912 by only five species. That year the winter was one of the coldest in thirty years,

In six years, the migration of the Vesper Sparrow has occurred within a period as short as two weeks—from March 26 to April 9. Only one record is found in March, and one in the second week of April. All the others—including the one for 1914—fall within the first week of April.

Like the Vesper Sparrow, the Flicker, in six years, had but one March record; but unlike that species, this woodpecker arrived for three springs in the first week, and for two springs, in the second week, of April. The whole period of migration for six years was 19 days—from March 24 to April 12.

The Towhee was regular in its arrival this year, reaching us on April 7. Four of the records of this species occur within less than a week—from the 2nd to 8th of April. The latest date of migration for the Towhee was April 17, 1909, and the earliest, March 19, 1910.

The Field Sparrow, in four springs, came north within 6 days—from March 31 to April 7. Although usually regular in its time of arrival, this sparrow has two March dates—the 21st and the 25th; the entire period of migration for six years being 17 days.

The Fox Sparrow migrates with regularity—its dates for the last three years all falling within the first week of April. The writer has no records of this species for the years, 1909 to 1911.

Another species with even fewer records than the Fox Sparrow, is the Loggerhead Shrike. The two records I have are—April 8, 1913, and April 7, 1914. To the future, then, it must be left to determine whether this species is regular in its spring migration.

A period of 15 days, in April, is the time of the Spring migration of the Hermit Thrush. The date for the present year is the 9th, which is one of the earliest. Three other records were later, the latest of all being in 1913—the 19th.

The Chipping Sparrow is both a March and an April migrant—there being four records in April and two in March. In the latter month the dates were the 29th and the 30th. In April, the records fall within ten days—two occurring on the 15th, which is also the latest date for this sparrow.

In the Brown Thrasher, we have a species whose records are remarkably regular. I shall give them all for six springs, beginning with 1909—April 17, 10, 16, 15, 12, 16. The trained observer is quite certain of his dates for this species, which sings either

loud in the tree tops or low in the hedges, on the first day of its arrival.

The Myrtle Warbler usually arrives regularly in the third week of April, the greatest difference in four years being only four days—April 16 to 20. Later dates were May 2, 1910, and April 26, 1912. From these records it may be seen that the whole period of migration covers 16 days.

Although the dates of the Barn Swallow are more scattered than those of the Myrtle Warbler, still the period of migration is the same—16 days in April. This year the species arrived on the 22nd, which is one of the late dates. The record last year was the 11th, the earliest I have made.

Some species that were winter or spring visitants and departed for the north in April were: Brown Creeper, Golden-crowned Kinglet, Purple Finch and Tree Sparrow. The Tree Sparrow's date of departure in 1914 was the 23rd, which is identical with 1912. In 1913, this species left us on the 6th, which is certainly quite irregular when compared with the other two dates. The Purple Finch, in three years, departed on the 14th in 1909, on the 9th in 1911, on the 18th in 1914. In four springs, the Golden-crowned Kinglet retired north on the 27th in 1910 and 1912, on the 10th in 1913, on the 23rd in 1914. The Brown Creeper's latest dates for three years were: the 30th in 1912, the 22nd in 1913, the 26th in 1914.

A number of unusually early records for certain species was made in April of this year. Among these are the following: Baltimore Oriole and Spotted Sandpiper, on the 25th; Catbird, Chimney Swift, and Warbling Vireo, on the 26th. Yellow Warbler, on the 27th; Orchard Oriole and Kingbird, on the 28th. Most of my other earliest records of these species occurred in May.

Most of the May migrants this year were remarkable for their regularity. A comparison of a few records in 1913 and 1914 will readily indicate this fact. Dates of arrival in 1913 and 1914: Chestnut-sided Warbler, 5th and 4th; White-crowned Sparrow, 7th and 6th; Blue-headed Vireo, 10th and 11th; Least Flycatcher, 12th and 14th; Scarlet Tanager, 13th and 11th; Wood Pewee, 14th and 11th; Blackburian Warbler, 11th and 16th; Magnolia Warbler, 16th and 13th; Black-poll Warbler, identical.—Dates of departure in 1913 and 1914: Ruby-crowned Kinglet, 3d and 5th; Myrtle Warbler, 15th and 17th; White-crowned Sparrow,

16th and 15th; Yellow Palm Warbler, identical; White-throated Sparrow, 21st and 24th; Black-throated Green Warbler, 24th and 19th; Magnolia Warbler, 25th and 19th; Hermit Thrush, 30th and 28th.

Six spring records of the Yellow-billed Cuckoo show that this species is a regular migrant, all the dates following within the last two weeks of May. The earliest date was the 16th, and the latest, the 30th.

The Redstart is an exception to the regularity of most of the migrants in May. A glance at six of its Spring records will show the truth of this statement: May 12, 1909; May 4, 1910; April 25, 1911; May 3, 1912; April 20, 1913; May 10, 1914. Here there are three different sets of records, which is remarkable.

The total number of migrants seen this spring was 79.

MARCH.

- 4 Sparrow Hawk
- 5 Hairy Woodpecker
- 5 Song Sparrow
- 5 Snowflake departed
- 10 Meadowlark
- 10 Killdeer
- 11 Cardinal
- 11 Purple Finch
- 13 Bluebird
- 13 Robin
- 14 Canada Geese
- 16 Herring Gull
- 24 Red-winged Blackbird
- 25 Sapsucker
- 27 Kingfisher
- 28 Golden-crowned Kinglet
- 30 Mourning Dove
- 31 Phoebe
- 31 Cowbird

APRIL.

- 2 Vesper Sparrow
- 7 Towhee
- 7 Field Sparrow
- 7 Fox Sparrow
- 7 Loggerhead Shrike
- 9 Hermit Thrush
- 12 Flicker
- 14 Wilson Snipe
- 15 Chipping Sparrow

- 16 Brown Thrasher
- 17 Ruby-crowned Kinglet
- 18 Pine Grosbeak
- 18 Myrtle Warbler
- 18 Purple Finch departed
- 20 Chickadee departed
- 22 Barn Swallow
- 23 Tree Sparrow departed
- 23 Golden-crowned Kinglet departed
- 25 Yellow Palm Warbler
- 25 Black-throated Green Warbler
- 25 Spotted Sandpiper
- 25 Baltimore Oriole
- 26 Brown Creeper departed
- 26 House Wren
- 26 Sapsucker departed
- 26 Warbling Vireo
- 26 Catbird
- 26 Chimney Swift
- 27 Yellow Warbler
- 28 White-throated Sparrow
- 28 Acadian Flycatcher
- 28 Kingbird
- 28 Orchard Oriole

MAY.

- 2 Gnatcatcher
- 3 Savanna Sparrow
- 4 Chestnut-sided Warbler
- 4 Ovenbird
- 5 Ruby-crowned Kinglet departed

- | | |
|-----------------------------------|------------------------------------------|
| 5 Crested Flycatcher | 16 Black and White Warbler departed |
| 6 White-crowned Sparrow | 17 Blue-headed Vireo departed |
| 8 Connecticut Warbler | 17 Black-poll Warbler |
| 9 Indigo Bird. | 17 Red-eyed Vireo |
| 10 Black and White Warbler | 17 Myrtle Warbler departed |
| 10 Redstart | 17 Yellow Palm Warbler departed |
| 10 Rose-breasted Grosbeak | 17 Rose-breasted Grosbeak departed |
| 11 Least Flycatcher | 18 Bobwhite |
| 11 Wood Pewee | 18 Connecticut Warbler departed |
| 11 Scarlet Tanager | 19 Yellow-billed Cuckoo |
| 11 Maryland Yellowthroat | 19 Magnolia Warbler departed |
| 11 Blue-headed Vireo | 19 Black-throated Green Warbler departed |
| 11 Pine Warbler | 20 Tennessee Warbler departed |
| 11 Red-breasted Nuthatch | 20 Purple Martin |
| 11 Greater Yellowlegs | 23 Yellow Warbler departed |
| 11 Bobolink | 24 White-throated Sparrow departed |
| 12 Wood Thrush | 27 Dickcissel |
| 13 Magnolia Warbler | 27 Black-poll Warbler departed |
| 14 Wood Thrush departed | 28 Hermit Thrush departed |
| 15 Ovenbird departed | 29 Hummingbird |
| 15 White-crowned Sparrow departed | |
| 16 Blackburnian Warbler | |
| 16 Nighthawk | |

NOTES ON OUR LOCAL PLANTS.—XII.

BY J. A. NIEUWLAND.

Family 91. **ROSACEAE** B. Jussieu, 'Trianon, (1759:
also A. Jussieu, Gen. lxx, 374 (1789), Gerard
(1761), Duchesne (1764).

ROSA Vergil 4: 134, Aen. 12: 69, Culex, 398.

Also *Rosa* Apul. Met., XI, Aus. Idyll XIV, Varro, Harpocrates, Ovid, Fast 5:354, Pliny 11:4, Cels. 4, 5, 8, 4, *Rhodon* Arist., Probl., 5:12:8, Anacr., Od. 43, Theophrastus 6:6, *Rodonia* Theophrastus, Hist., 1:15, *Cynosbates* Pliny 14:23, *Cynorrhodos* Pliny 8:14, 25:2 = *Rosa canina* Linn., *Rosa* of all the pre-Linnaean writers without exception. *Rosa* Linn., Syst (1735), Gen. 146 (1737), 217 (1754), Tour., Els., 500 (1694), 636, (1700).

Rosa setigera Michx., Fl. Bor. Am., 1, 295 (1803).

Found at Notre Dame.

Rosa canina Camerarius, Hort. Med., 146 (1588).

Cynosbatus Dioscorides, (?), *Cynorrhodos* Pliny, l. c., *Rosa canina* Linn., Sp. Pl., 491 (1753).

Lawton, Mich., 9498, Websters N. of Notre Dame, 9091, Lakeville, 2740.

Rosa blanda Ait. Hort. Kew., 2, 202 (1798).

Lake Co. (Hill).

Rosa pratincola Greene Pitt., 4, 13 (1899).

13090 Notre Dame.

Rosa acicularis Lindl., Ros. Monog., 44, pl. 8, (1820).

Rosa Engelmanni S. Watson., Gard. and Forest, 2, 376 (1889).

Lake and Porter Cos., (Cowles), Lake Co., (Hill).

Rosa carolina Linn., Sp. Pl., 492 (1753).

Clarke, Ind., (Umbach), Lake Maxinkuckee, (Clarke), 1885, 9386, 9479, 2240, Notre Dame, Webster, N. Notre Dame, 1900, Hudson Lake, K22, Chain Lakes, K22½.

Rosa rubiginosa Linn., Mant., 2, 564 (1771).

Rosa micrantha J. E. Smith Engl. Bot. pl. 2490.

Rosa eglanteria Miller. Dict. 8ed. No. 4 (1768) not Linn. (1753).

Rosa virginiana Miller, Gard. Dict. 8ed (1768).

Rosa humilis Marsh., Arb. Am. 136 (1785), *Rosa parviflora* Ehrh. Beitr, 4:12 (1789), *Rosa lucida* Ehrh. l. c. 22.

3914 Notre Dame (Johnson), Lake Maxinkuckee (Clarke), St. Joseph Co. (Barnes), 11291, 11287 Crumstown, 11701, 11492, 11256 South Bend, 10234 Mineral Springs, 9667 Chain Lakes.

Family 92. **POMIFERAE** Ray, Meth. 30 (1682).

Pomiferae Boerhaave. *Pomaceae* Linn., Phil. Bot. 31 (1751 and 1755). *Malaceae* Small. Fl. S. E. U. S. 529 (1903).

AUCUPARIA Rivinus, ex Rupp. Fl. Jen. 140 (1726) *Sorbus* in part of authors. *Aucuparia* Medicus Geschicht 86 (1793).

Ancuparia subvestita (Greene).

Sorbus subvestita Greene, Pitt. 4, 130 (1900).

2006 near Mishawaka, Ind. Along the St. Joseph River. Scarce.

Aucuparia americana (Marsh).

Sorbus americana Marsh. Arb. Am. 145 (1785).

Reported by Deam to me from Laporte Co. (Only one specimen found).

MALUS Vergil Georg 11:70.

Malus Colum. de Re. Rust. XII:44 Pliny XIII:2, XV:14. *Melea* of the Greeks, Homer, Hesiod, Pausan. *Malus* Tour., Els. 499 (1694), I. R. H. 634 (1700). Miller, Gard. Dict. ed. 4 (1754), *Pyrus* Linn. in part.

Malus ioensis (Wood) Britton, Britton and Brown, Ill. Fl. 2: 235 (1897).

Malus coronaria var. *ioensis* Wood, Class-book, 333 (1860), *Pyrus ioensis* Carruthers, Trans. Kans. Acad. Sci. 5:48 (1877).

11048 Lakeville, 11046 Chain Lakes.

Malus sylvestris Dodonaeus, Pempt. 790 (1583). also Miller Gard. Dict. 8 (1768).

Pyrus Malus Linn., Sp. Pl. 479 (1753).

Lake Maxinkuckee (Clarke), 11750 Notre Dame. Common throughout the region.

Malus glaucescens Rehder, Trees and Shrubs, 2: 139 (1911).

Lake Maxinkuckee (Clarke), Starke Co., Laporte Co. (Deam), 2496 Notre Dame, (Powers), 9264, 10593, 11128, 11137, 11445, 11690 Notre Dame.

PYRUS Varro, 1:40, Vergl. Georg. IV:145 Columella, De Re Rust., V:10 Orb. 24.

Apios Dioscorides etc., *Pyrus* Tour. Els. 498 (1694) I. R. H., 628 (1700) Linn. Syst. (1735), Gen. 145 (1737), 214 (1754).

Pyrus sylvestris Dodonaeus, Pempt. 351 (1583), also C. Bauhin, Pin. 439 (1623).

Pyrus communis Linn., Sp. Pl. 479 (1753). *Pyrus sativa* C. Bauhin also Tour. Els. 498 l. c. and *Pyrus sylvestris* Tour., Els. l. c.

Common throughout the region., esp. St. Joseph Co. and Berrien Co.

AMELANCHIER Pena and Lobelius Obs. 60 Adv. 441 (1576) also Medic, Phil. Bot. 155 (1789).

Amelanchier canadensis (Linn.) Med. Geschichtz 79 (1793).

Mespilus canadensis Linn., Sp. Pl. 478 (1753).

Dune Park (A. Chase), Marshall Co., Laporte Co., Lake Co. (Deam), Lake Maxinkuckee (Clarke), 1981 Notre Dame (Powers), 2221, 9473 Notre Dame, 11068 Benton Harbor. Common everywhere in the region.

(To be continued.)

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SEPTEMBER, 1915.

NO. 5

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Devoted to Natural History, Primarily
that of the Prairie States

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J. A. NIEUWLAND, C. S. C., Ph. D., Sc. D., Editor

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Fig 1

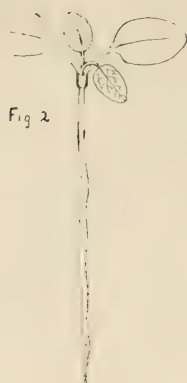


Fig 2

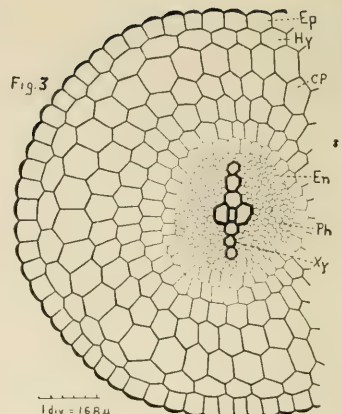


Fig 3

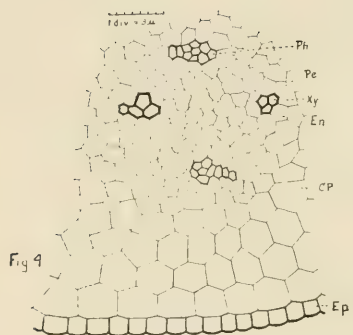


Fig 4

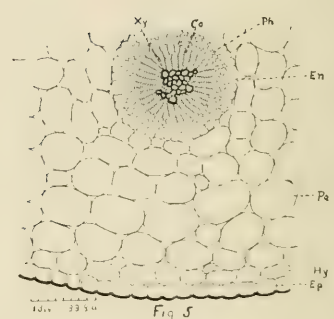


Fig 5

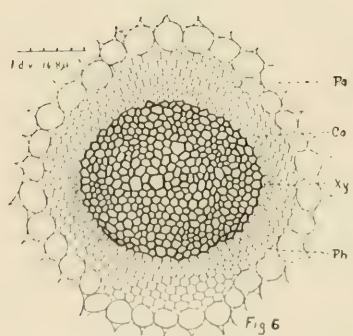


Fig 6

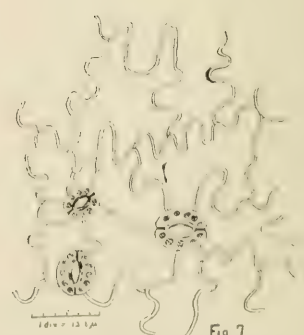


Fig 7

The American Midland Naturalist

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NO. 5.

SAMBUCUS PUBENS VAR. XANTHOCARPA.

BY JAMES J. LYNCH.

The species *Sambucus pubens* was first recognized as distinct from the European *Sambucus racemosa*¹ by Michaux,³ but Britton⁴ identifies it with *Sambucus racemosa* of Europe. The new variety *xanthocarpa* was found by Nieuwland (2) and showed sufficient differences from *Sambucus pubens* and *Sambucus racemosa*, and this will here be considered for study.

HABIT OF THE SEEDLING.

The young seedlings were grown indoors and seemed to thrive easily under ordinary cultivation. The seeds are ovoid in shape, channelled and have minute transverse linear markings. In the germination of the seed the embryo breaks through the seed coat very close to the scars and primary root and hypocotyl emerge in succession. (Fig. 1). The cotyledons are ovate to spatulate in shape and the petiole is ridged longitudinally on its inner side. The primary root goes down to a length of about one and a half centimeters from a more or less prolonged hypocotyl and is covered by numerous root hairs. Upon further development of the epicotyl there appear two or three simple serrate leaves, broadly ovate to cordate. (Fig. 2.) The formation of stem and the increase of leaf development occurs in usual way of dicotyledons. (Fig. 13.) The later leaves, however, become more and more typically pinnate. The first are trifoliolate with small ovate side leaflets and a large apical one. Transition stages are found between simple and compound leaves. The simple

¹ Part of thesis offered as partial requirement for degree of B. S. in Biol.

² Linnaeus, C., *Species Plantarum*, 270 (1753).

³ Michaux, A., *Flora Bor. Americana* I. 181 (1803).

⁴ Nieuwland, J. A., *Am. Mid. Nat.* III., 310 (1914).

leaflets have a tendency of unequalization of halves, but especially it is the apical leaflet that is inequilateral.

ANATOMY OF THE SEEDLING.

The primary root has a single radial woodbundle that continues partly through the hypocotyl and gives off two branches for the petioles of the cotyledons. The main part continues into the epicotyl and from this collaterals are given to the leaf petioles as soon as they appear. The stele of the hypocotyl in cross section is diarch exarch.

PRIMARY ROOT. (Fig. 3).

A cross section of the primary root shows the woodbundle to be radial, diarch and with apparently a continuous strand of xylem (Xy) having phloem on both sides (Ph). The growth of xylem is exarch and the ducts are spiral and annular. The endodermis (En) is regular and clearly differentiated by the size of cells. In shape the cells are in no way different from the surrounding cortex but do not have Casparyan spots, a common peculiarity of this tissue. In very young plants the periblem (CP) is composed of about four layers of cells which increase in size outwards and merge into a series of more or less flattened cells which constitute the hypodermis (Hy). The epiblema (Ep) cells are thick walled on their outer side and are more palisaded in shape than those lying below them.

EPICOTYL (Figs. 4, 5, 6.)

The section illustrated in this figure (Fig. 4) is a very young stage and cut close to the root. The stele like that of the root is diarch exarch and the cells of the pith are very irregular in shape. The stele is present in the middle of the pericycle and this has an endodermis not well defined. The cortical parenchyma of about four layers shows an irregular structure in the size of its cells. A distinctive hypodermis is lacking altogether and the outer layer (Ep) consists of smaller thicker cells than the underlying parenchyma.

A cross section of an older seedling (Fig. 5) shows the changes which occur in the hypocotyl due to later growth. The proto- and meta-phloem (Ph) have been pushed out by the formation of cambium (Ca) which now surrounds the xylem (Xy) and is itself enclosed by the secondary phloem. The development of xylem is irregular and lateral to the proto- and meta-phloem.

The endodermis (En) is quite regular and clearly distinct from the cortical cells around it. The cortical parenchyma cells are round in outline of cross section and the hypodermis is very distinct.

A cross section of the hypocotyl (Fig. 6) shows the stele nearly filled with xylem (Xy). The secondary xylem pushes out the cambium (Ca) and this then constitutes four layers of cells. The phloem (Ph) encircles the xylem which completely fills the inner part of the stele, there by showing the absence of pith. The xylem is fully developed. The cross section was made from a point high up the length of the stem.

COTYLEDON AND ITS PETIOLE. (Fig. 9).

As a general rule the cotyledon is notched at its apex and has one closed collateral wood bundle with xylem (Xy) to the upper and phloem (Ph) to the lower side. Chlorenchyma is found in the intervening space between the stele and epidermis (Ep). A distinct hypodermis (Hy) is present just below the epidermis. The petiole of the cotyledon is in no way different from that of the leaf, which will be discussed later.

The upper and lower epidermis (Fig. 7) of the cotyledon have about the same structure. The cells are very irregular in shape and the stomata contain chlorophyll grains and are more numerous upon the ventral face than upon the dorsal surface. Intercellular spaces (IS) are found interposed between the cells of the chlorenchyma (Fig. 8).

EPICOTYL (Fig. 10).

The epicotyl in early growth soon has about twelve collateral woodbundles, two of which are shown in the illustration. Three layers of cells constituting the cambium (Ca) and very little differentiated from the phloem (Ph) in size and shape, are interposed between the xylem (Xy) and phloem. Wood parenchyma cells are interspersed between the cells of xylem. The pith (Pi) consists of cells of regular outline. The parenchyma (Pa) is composed of cells of irregular size. A hypodermis (Hy) is found beneath the epidermis (Ep) which apparently consists of two layers, the outer layer of which is not very much thickened as is usually the case.

PETIOLE OF THE LEAF. (Fig. 11).

The cross section of the petiole of the leaf is circular in out-

line and has three closed collateral woodbundles. The xylem (Xy) is inward and the phloem (Ph) outward. Cortical parenchyma occupies the intervening space between the stele and the epidermis and a distinctive hypodermis (Hy) does not exist. The epidermis (Ep) is composed of cells longer than broad with a thickened cuticle.

THE LEAF. (Fig. 12).

The epidermis of the leaf, dorsal as well as ventral is composed of cells not unlike those of the cotyledon and in general has the same appearance. The cells are flattened and diminish in chlorophyll content towards the outside. There are large intercellular spaces between the chlorenchyma cells. The epidermis (Ep) shows a greater thickening in its walls than in those of the adjoining cells.

CONCLUSION.

1. Pith is absent in the primary root and hypocotyl of the young seedling, but is present in the upper part of the hypocotyl and epicotyl.

2. The plant at first produces simple leaves but by a series of transitional stages compound leaves are formed, the apical leaf being the largest.

3. As the lower part of the hypocotyl matures the entire center of the stele is filled with xylem and no pith is to be found.

EXPLANATION OF THE FIGURES.

Fig. 1. Seedling showing the emergence of root, hypocotyl, and cotyledons from the seed.

Fig. 2. A more advanced stage of the seedling showing the cotyledons, hypocotyl, root and two young leaves.

Fig. 3. Cross section of the primary root. (Ep) Epidermis, (Hy) Hypodermis, (CP) Fundamental parenchyma, (En) Endodermis, (Pi) Pith, (Xy) Xylem (Hadrome), (Ph) Phloem (Leptome).

Fig. 4. Cross section of a very young hypocotyl. (Ep) Epidermis, (CP) Cortical parenchyma, (En) Endodermis, (Xy) Xylem, (Pe) Pericycle, (Ph) Phloem.

Fig. 5. Cross section of hypocotyl. More advanced stage than the preceding. (Ep) Epidermis, (Hy) Hypodermis, (Pa) Extrastelar Parenchyma, (En) Endodermis, (Ph) Phloem, (Ca) Cambium, (Xy) Xylem.

Fig. 6. Cross section of hypocotyl, showing still further development. Wood bundle alone is illustrated. (Pa) Parenchyma, (Ca) Cambium, (Xy) Xylem, (Ph) Phloem.

Fig. 7. Surface view of ventral epidermis of cotyledon. Illustration

shows stomata with companion cells and the adjoining cells of the epidermis.

Fig. 8. Section of chlorenchyma in cotyledon. (IS) Intercellular space. (Cl) Chlorenchyma proper.

Fig. 9. Cross section of a cotyledon. (Ep) Upper epidermis, (EP) Lower epidermis, (Hy) Hypodermis, (Cl) Chlorenchyma, (Xy) Xylem, (Ph) Phloem.

Fig. 10. Cross section of epicotyl. (Ep) Epidermis, (Hy) Hypodermis, (Pa) Parenchyma, (Ph) Phloem, (Ca) Cambian layer, (Xy) Xylem, (Pi) Pith.

Fig. 11. Cross section of the petiole of one of the first leaves. (Ep) Epidermis, (Hy) Hypodermis, (Pa) Parenchyma, (Xy) Xylem, (Ph) Phloem.

Fig. 12. Cross section of an early leaf. (Ep) Upper epidermis, (EP) Lower Epidermis, (Cl) Chlorenchyma, (Is) Intercellular Space, (St) Stoma, (Xy) Xylem, (Ph) Phloem.

Fig. 13. An advanced stage of seedling growth.

THE NAIADES OF MISSOURI.—III.

BY WILLIAM I. UTTERBACK.

Rotundaria granifera (Lea).

("Purple Warty Back," "Purple Pit.")

Pl. XIX, Figs. 55 A and B.

1838—*Unio graniferus* Lea, Tr. Am. Phil. Soc., Vi, p. 69, Pl. XIX, fig. 60.

1900b—*Quadrula granifera* (Lea) Simpson, Proc. U. S. Nat. Mus., XXII, p. 795.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Identical with those of *R. tuberculata* in all respects.

REPRODUCTIVE STRUCTURES:—Typical specimens from the Mississippi show the outer gills marsupial; conglutinates same color and form as those of *R. tuberculata*; glochidium measures 0.290 x 0.350mm., being a little larger with more of an undulated hinge line, but with the same general form.

SHELL CHARACTERS

EXTERNAL STRUCTURES:—Like *R. tuberculata* except smaller rotund, upright, alated, inflated,—especially fuller, higher, more antero-protruding beaks and with more of a rayed character of epidermis on anterior umbonal slope. Interior of shell identical

except perhaps shorter laterals arranged at right angles to the interdentum.

Sex	Length		Height		Diameter	Locality
♂	57	x	57	x	40 mm	(Miss. R., LaGrange)
♀	56	x	56	x	34 "	(" " ")
♂	46	x	46	x	30 "	(" " ")
♀	23	x	21	x	10.5 "	(White " Hollister)

The latter measurement is of a juveniles from a lot identified by Mr. Frierson as approaching *granifera* although would perhaps fall more under *tuberculata*. However, it meets the test of *granifera* in length and height being about equal and in prominent beaks. Its beak sculpture consists of numerous, fine concentric corrugations extending out on disk somewhat like *Q. quadrula*. In general shape of shell and disposition of tubercules it is also like the latter in this adolescent stage.

MISCELLANEOUS REMARKS:—According to shell measurement, and with an allowance for eroded beaks, the Osage forms may be more classed under *granifera*. A divergence of equality for length and altitude may indicate and approach to the *tuberculata*, Lea's type, when diameter may be reduced to unity, it measures length and height the same. On this same basis so many of the *Rotundariae* of South Missouri would approach more nearly to the *granifera* type. Because of its full, projecting beaks, uprightness of shell and disk sculpture this species has sometimes been confused with *Q. pustulosa* and *P. cooperianus*. However, distinction can be easily made by comparing to the rich purple nacre of *granifera*—a color that is not possessed by either *pustulosa* or *cooperianus*. Its breeding season is found to be the same as that of *tuberculata*. Despite their identity of breeding habits, of reproductive and nutritive structures and of internal shell characters there may be sufficient evidence of difference in external shell structures to make *granifera* a good species and thus take it out of its class as a subspecies of *tuberculata*, as Simpson had treated it, and elevate it as Mr. Walker considers.

Genus *Plethobasus* Simpson.

1900b—*Plethobasus* Simpson, Proc. U. S. Nat. Mus., XXII, p. 764 (As section).

1912b—*Plethobasus* (Simpson) Ortmann, An. Car. Mus., VIII, pp. 259-260.

(Type, *Unio aesopus* Greene).

ANIMAL CHARACTERS:—Anal separated from supra-anal

opening by short mantle connection; gills long, wide anteriorly, inner laminae of inner gills free from visceral mass; palpi short and wide; only outer gills marsupial, when gravid the ovisacs distend but little, giving the conglomerates a lanceolate shape; conglomerates white, discharged whole; glochidium small, spineless, subovate or slightly oblique; soft parts orange or sulphur color.

SHELL CHARACTERS:—Shell elongated to ovate; beaks moderately high, sculptured by obscurely concentric ridges, not extending out on disk; epidermis brown to yellow, usually rayless; beak cavities moderately deep; hinge well formed; nacre white to pinkish.

As to shell characters this genus resembles both those of *Quadrula*—particularly those of the *pustulosa* group—and also the genus *Rotundaria*. Its marsupial characters show an advance over the genus immediately preceeding. The bright coloration of its nutritive soft parts and of its ova would suggest some affinity with the *Fusconaia*. Dr. Ortmann points out this genus as a connecting link between the more primitive *Unioninae* and those of the type of the genus *Placurobema* and thus elevated Simpson's section, *Plethobasus*, to generic rank, since Simpson recognized special characters of the type, *aesopus*, in shallow beak cavities and outer gills only as marsupial. This genus is represented in this state by *aesopus*, but doubtfully by *cooperianus*.

***Plethobasus cooperianus* (Lea).**

("Cumberland Pig-toe," "Warty Pig-toe.")

Pl. XX, Figs. 57 A. and B.

1834—*Unio cooperianus* Lea, Tr. Am. Phil. Soc., V., p. 61, pl. VIII, fig. 21.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal and supra-anal separated by short (even deciduous) connection; gills rather short, inner gills wider, its laminae free from visceral mass; color of soft parts bright orange yellow, for most part.

REPRODUCTIVE STRUCTURES:—Marsupia only occupy outer gills; when gravid swell moderately in center leaving ventral edges sharpened; no glochidia found yet; its ova bright yellow, giving the marsupia a sulphur color.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell orbicular, to egg-shape in general outline, disk tuberculated and transversely nodulous between beaks and ventral margin in front of post-umbonal ridge; latter flattened, dorsal ridge low, faintly costated; beaks low, well placed anteriorly; epidermis light-brown to yellowish, somewhat glossy.

INTERNAL STRUCTURES:—Cardinals tripartite in left valve, rather single in right; interdentum broad, rather doubly gashed in right valve; laterals double in left and single in right valve; mantle line high up from ventral margin; nacre whitish, pinkish (or even bluish) within the mantle line, usually lighter color on extra-mantle line border.

Sex	Length	Height	Diameter	Locality
♂	60	x 55	x 32	(Gasconade R., Gascondy)
♀	77	x 62	x 41	(Osage R., Monegaw Springs)
♂	70	x 64	x 40	(" " Warsaw)

MISCELLANEOUS REMARKS:—As this state is out of geographic range of typical *cooperianus* it is natural that no real type may be found in Missouri. However, the writer upon finding a few shells of the *tuberculata* (Raf.) type with white and pink nacre submitted one of the latter to Mr. Walker for his consideration. His comments are:—"A very curious and interesting shell. It has the shape of *Quadrula tuberculata* (Raf.) but the nacre of *cooperiana* (Lea) and I should call it that, although out of range. I never heard of *tuberculata* except with purple nacre." A white nacre shell of the same form is considered by Prof. Clark as "rather plump, approaching *granifera*" but that the nacre "suggests *cooperiana*." Other Missouri collectors have commented upon this strange departure of *R. tuberculata* and *granifera* from type. However, if it may be proved that this difference of nacre-color is merely a "fading out" due to chemical reaction of mineral water there would be instead of a true *cooperianus* in this state a mere local form of a *Rotundaria*. The real home of this species is in the Tennessee-Cumberland system where Wilson and Clark (1914, pp. 44 and 60) have found it as a summer breeder (a tachytictic species).

Plethobasus aesopus (Green).¹

("Bull Head," "Sheep's Nose," "Clear Profit.")

Pl. XX, Figs. 56 A and B.

1827—*Unio aesopus* Green, Cont. Mac. Lyceum, I, p. 46, fig. 3.

1834—*Unio cyphia* Conrad, New F. W. Shells, p. 68.

1900b—*Pleurobema aesopus* Simpson, Proc. U. S. Nat. Mus., p. 764.

1912b—*Plethobasus aesopus* (Green) Ortmann, An. Car. Mus., VIII, pp. 260-261.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely set with long and short papillae; anal smooth; supra-anal connected to anal by short mantle attachment; gills long and sharply pointed posteriorly, inner gills wider in front, inner laminae free from visceral mass; palpi short, wide; color of soft parts, peculiar, mostly orange, the foot, adductors and mantle margins being a brighter orange.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial; ovisacs, when gravid, swell moderately in the center leaving their unswollen distal ends pointed, thus giving their conglutinates narrow, lanceolate shape which are solid, red and discharged in unbroken form; glochidia semicircular, ventral margin obliquely rounded, hinge line long, medium in size, length slightly greater than height (0.220 x 0.200mm).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell triangular, rounder before, pointed behind, rather heavy; post-umbonal ridge rounded; umbones high and full, tilted anteriorly, incurved, sculptured by a deep furrow just posterior to tip of each beak and by a few coarse concentric ridges and fine radiating lines; disk sculptured by a row of six or eight, coarse, elongated, undulated or hummocky tubercles extending from beaks to ventral margin with a broad, shallow trough between this tubercled row and the post-ridge; epidermis dark straw to glistening yellowish brown.

INTERNAL STRUCTURES:—Cardinals double in left, single in right; interdentum narrow; laterals double in left only faintly

¹ According to Rafinesque's evident description of Green's *aesopus* in his Monograph of 1820 (p. 39) under the name of *Obliquaria cyphia* (*U. cyphia*) this species should really bear the name now of *Plethobasus cyphius* (Raf.) because of priority.

double in right; umbonal cavity moderately deep; nacre pearly white, iridescent.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	87	x 70	x .47	—	0.170 (Miss. R., Hannibal)
♂	63	x 45	x 34	—	0.230 (Des Moines R., Dumas)
♀	55	x 40	x 32	—	00.180 (Little Blue, Courtney)
♂	33	x 22	x 20	—	0.210 (Des Moines R., Dumas)

This last measurement of a young shell shows great inflation comparatively (See *Figs. 56 C and D.*)

MISCELLANEOUS REMARKS:—This species has a general distribution over the Ohio - Cumberland system. It is not uncommon in the Mississippi and Des Moines Rivers, but has only been found in one interior stream, the Little Blue, Kansas City, where it was collected by Mr. Bush and donated to the U. S. National Museum under No. 134,642. Some have found all four gills of *aesopus* marsupial, but most observations seem to prove that only the outer are used as marsupia. The writer has only observed outer gills as marsupial—even in case of many individuals with sterile gills. He is able to verify Dr. Ortmann's observation of charged marsupia with the "lilac hue." Its accidental host has been found to be "sauger" (*S. canadense*).

Genus *Pleurobema* Rafinesque.

1820—*Pleurobema* Rafinesque, Monograph of Bivalve Shells of River Ohio, Ann. Gen. Sci. Phys. Brux., p. 313.

1900b—*Pleurobema* (Raf.) Simpson, Proc. U. S. Nat. Mus., XXII, p. 745 (amended).

(Type, *Unio clava* Lamarck.)

ANIMAL CHARACTERS:—Anal opening with short mantle connection to supra-anal; inner gills much longer, inner laminae free from visceral mass; palpi small very pointed; only outer gills marsupial; ovisacs distend but little when gravid; conglutinates white, narrowly leaf-like or lanceolate, not broken; glochidium small, spineless, subovate.

SHELL CHARACTERS:—Shell subtrapezoidal, subquadrate, rounded or elongated, upright, or, when oblique, with beaks produced anteriorly; beaks usually rather full and high, sculptured obscurely with concentric ridges not extending out on the disk; disk without sculpture; epidermis olivaceous, reddish brown or even black, rays more or less present in umbonal region; hinge

teeth well developed; umbonal cavities moderately deep; nacre generally whitish or red.

MISCELLANEOUS REMARKS:—The above descriptions of the anatomy shows the genus to be identical to that of the genus *Plethobasus*; but in shell characters there is much difference. It may well be stated in general terms that *Pleurobema* resembles *Quadrula* as to its nutritive soft parts and *Fusconaia* as to external shell structures. However, the *Pleurobema* shell does not usually possess such a prominent, angular, and inflated umbonal ridge as that of the *Fusconaia*; neither does it possess the yellowish color of the nutritive anatomy as in the case of *Fusconaia*. However, the differences among the species of *Pleurobema* are well marked ecological, as well as morphological, ones; i. e., the heavier, more inflated forms being more as dwellers in the large rivers, and the smaller, more compressed shells being found in the creeks and medium sized rivers. From the two following genera *Pleurobema* may be easily distinguished by not possessing such an elongate and straight type of shell.

The author of this catalogue wishes to gratefully acknowledge the dedication of a new species of *Pleurobema* to him under the authorship of Mr. Frierson. The description and figures of this new species (*Pleu. Utterbackii* F.) appear here for the first time, and, until more data can be secured, concerning its soft parts in gravid condition, it is placed here tentatively at the close of the list of *Pleurobema*.

***Pleurobema obliquum* (Lamarck).**

("Pig-toe," "White Pig-toe," "Ohio River Pig-toe.")

Not figured.

1819—*Unio obliqua* Lamarck, An. Sans. Vert., VI, p. 72.

1900b—*Quadrula obliqua* Simpson, Proc. U. S. Nat. Mus., XXII, p. 788.

1912b—*Pleurobema obliquum*, (Lamarck) Ortmann, An. Car. Mus., VIII, p. 264.

ANIMAL CHARACTERS:—The soft part of typical *obliquum* not having been seen by the author, reference is made to the descriptions of the varieties of this species—the anatomy of which is, of course, identical. Wilson and Clark (1914, p. 61) report this species as occasionally bearing ova in all four gills and that the conglutinates have the appearance of cucumber seeds.

SHELL CHARACTERS:—Shell trigonal, medium in size, emargi-

nated post-ventrad with radial furrow in front of flattened post-umbonal ridge; beaks swollen, protruding anteriorly, sculptured by concentric ridges; epidermis reddish brown to black with rays originating in umbonal region; cardinals heavy, double in left single in right valve; laterals double in left, more or less double in right valve; nacre white.

MISCELLANEOUS REMARKS:—The writer has been unable to find *Pleu. obliquum* in typical form anywhere in the state and claim is only made for it through its various forms and through Simpson's report, that it is found in the Mississippi above the mouth of the Missouri River. Surely there is much need of research chiefly with regard to the geographic facts relating to the distribution of this species. Most students of geographic distribution concur in the belief that no true *obliquum* is found west of the Mississippi and that it is rarely seen north of the Ohio. Its metropolis is that richest of all centers of mussel faunae, the Cumberland River, where Wilson and Clark report it as the most abundant of all the numerous species found there. Briefly stated, *obliquum* occurs in this state, but with its characteristic radial furrow obliterated and its intergrading forms are very numerous running into each other in every puzzling way.

Pleurobema obliquum plenum (Lea).

Not figured.

1840—*Unio plenus* Lea, Tr. Am. Phil. Soc., I, p. 286; Tr. Am. Phil. Soc., VIII, 1843, p. 211, pl. XIV, fig. 26.

1900b—*Quadrula plena* Simpson, Proc. U. S. Nat. Mus., p. 790.

The writer has not found this species in this state and no description appears here, since neither soft parts nor shells have been seen. However, *plenum* is listed as a variety for Missouri through the kind report of Mr. Walker that he has it from the James River, near Springfield, and that it bears the same relation to *obliquum* as does also a variety of *coccineum* found in the same locality.

Pleurobema obliquum pyramidatum (Lea).

("Pig-toe," "Pyramid Pig-toe.")

Pl. XX, Figs. 58 A and B.

1834—*Unio pyramidatus* Lea, Tr. Am. Phil. Soc., IV, p. 109, pl. XVI, fig. 39.

1900b—*Quadrula pyramidata* Simpson, Proc. U. S. Nat. Mus., XXII, p. 790.

1912b—*Pleurobema pyramidatum* (Lea) Ortmann, An. Car. Mus., VIII, p. 264.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal finely papillose; anal and supra-anal very closely connected by mantle edges—sometimes connection deciduous;—inner gills broader, longer, inner laminae free from visceral mass; palpi long and thickened; most of soft parts dirty white, mantle edges at branchial openings black.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial; sterile marsupia with crowded septa, those of male gills very distinct and more separated; no gravid specimens found.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell obliquely pyramidal or trap-ezoidal, very solid and heavy anteriorly; disk smooth; beaks very full and projecting anteriorly; rather straight dorsad, greatly curved ventrad, epidermis black.

INTERNAL STRUCTURES:—Cardinals single in right, double in left valve; laterals double in left, single in right; scars deeply impressed; beak cavities moderately deep; nacre white, tinged with blue posteriorly—sometimes pinkish.

Sex	Length	Height	Diameter	Locality
♂	65 x	55 x	40mm	(Osage R., Sagrada)
♀	73.5 x	52.5 x	42 "	(" " Warsaw)
♀	63.5 x	54 x	39 "	(Meramec R., Fern Glen)
♂	27.5 x	26.5 x	19.5mm	(Osage R., Baker)

Juvenile shell thick, almost globular, very smooth; beaks full but not protruding anteriorly, sculptured with two or three ridges arranged rather concentrically and breaking into three coarse tubercles at base of post-umbonal ridge; epidermis reddish and leather-like with rays on the anterior half of shell; lateral teeth more inclined to double in right valve than in mature shell; beak cavities very shallow; nacre solid pink.

MISCELLANEOUS REMARKS:—This *pyramidatum* is the same as found in Arkansas and Oklahoma where it is also found unassociated with typical *obliquum*. The species, *Pleu. pyramidatum* (Lea) and *obliquum* (Lam.) are most typically represented in the Tennessee-Cumberland system and the fact of their forms turning up in the South West (i. e., in the region south of the Missouri and

west of the Mississippi Rivers) is a question worthy of investigation. This heavy, oblique shell is very easy to identify and cannot be very well confused with other *Pleurobema*. It has been defined as "an overgrown *Pleu. clava*."

***Pleurobema obliquum catillus* (Conrad).**

("Round Pig-toe," "Pink Pig-toe," "Osage Nigger-Head.")

Pl. XX, Figs. 62 A and B.

1836—*Unio catillus* Conrad, Monog. III, p. 30, pl. XIII, fig. 2.

1838—*Unio solidus* Lea, Tr. Am. Phil. Soc., VI, Pl. V, fig. 13.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Brachial opening rather large, with many papillae; anal smooth, separated from supra-anal by very short mantle connection; gills short and wide, inner the wider, its inner laminae free from visceral mass; palpi short, wide pointed; color of soft parts mostly dingy white.

REPRODUCTIVE STRUCTURES:—Outer gills only maruspal, when gravid brownish, slightly swollen longi-centrad leaving ventral edges tapering somewhat obtusely; conglutinates white, formed like seeds of an immature cucumber; glochidium intermediate for *catillus* and *obliquum* as to general form, but larger than either, averaging 0.170 x 0.180mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell trapezoidal to subovate, subglobose, thick, heavy, medium in size, rounded before, obtusely rounded behind; disk smooth no radial furrow; beaks high, full, sculptured by obscure concentric lines; epidermis of red-leather color, rayed anteriorly.

INTERNAL STRUCTURES:—Cardinals single in right, roughly double in left; laterals single in right, double in left valve; scars deeply impressed; beak cavities rather deep; nacre solid pink, rarely white.

Sex	Length	Height	Diameter	Locality
♂	57.5 x	41 x	33.0mm	(Marais des Cygnes R., Rich Hill)
♀	59 x	42 x	34.5 "	(" " " " " ")
♂	45 x	44 x	30.0 "	(Osage R., Bagnell)
♀	27 x	26 x	21.5 "	(" " Baker)

This last measurement shows this juvenile to be sub-globular. Its shell is unusually thick with very shallow beak and branchial

cavities; hinge teeth usually flattened, very wide and heavy; nacre bright pink; epidermis leathery-red with rays on anterior part of shell ...

MISCELLANEOUS REMARKS:—This form of *catillus* is the most common of the *Pleurobema* in the Osage-Gasconade system and is not found any where else in the state. This "*solida*" variety is characteristic for its small, solid, subglobular shell, with a more rounded posterior end and less compression for the posterior half than in typical *catillus*. The radial furrow of the type species (*obliquum*) is entirely lost. The only difference between this form in the two basins (that of the Osage and Gasconade) is in that of nacre-color—the Osage never varying from pink and the Gasconade shell always with white-nacre. The almost endless inter-gradations for *obliquum* and *catillus* seem to be the general rule rather than exception, but here in Central Missouri the variety herein described is predominant. Another form occasionally met with in the Osage and grading in between this subspecies and *catillus* is one that comes near to *fulgidus* of Lea, but it would not be listed on account of its rare occurrence and doubt whether it should be really separated from this variety, *obliquum catillus*. Hundreds of individuals of this form were examined daily throughout the entire month of July, when it was in the height of its breeding season, to find it only gravid (without exception) in its outer gills. It is found to be tachytictic. Perhaps the best idea can be obtained, concerning the difference of the Central Missouri *catillus* from that of South Missouri, by comparing two average measurements of mature shells given in the following:

Sex	Length	Height	Diameter	Locality
♂	87	x	64	x 41 (White R., Hollister)—S. Mo.
♂	54	x	44	x 30 (Osage R., Warsaw)—Cen. Mo.

In both the radial furrow of typical *catillus* is effaced. The measurement of the latter removes it so far from the type species that probably a good species might be made out of it.

***Pleurobema obliquum coccineum* (Conrad).**

("Pink Pig-toe," "Round Pig-toe," "Flat Nigger Head.")

Pl. XX, Figs. 61 A, B, C and D.

1836—*Unio coccineus* Conrad, Monog. III, p. 29, Pl. XIII, fig. I.

1839—*Pleurobema obliquum coccineum* (Conrad) Ortmann, Pr. Am. Am. Phil. Soc., LII, pp. 287—390.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Branchial opening with two ranks of papillae; anal crowded with fine, short papillae; supra-anal moderately separated from anal; inner gills slightly wider than outer, inner laminae free from visceral mass; palpi thick and long; connected antero-dorsad over half of length; color of soft parts dingy white, for most part.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial: when gravid marsupia cream colored, somewhat padiform; conglomerates white, leaf-like, solid; glochidium medium, subovate spineless, measures 0.150 x 0.155mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell roundly elliptical, thick and solid anteriorly, moderately thin and compressed for posterior half; post umbonal ridge flattened; beaks not prominent, nor protruding anteriorly, sculptured by concentric corrugations; epidermis reddish brown, rayed anteriorly.

INTERNAL STRUCTURES:—Cardinals double in both valves; laterals single in right, double in left valve; interdentum wide and thin; beak cavities shallow; nacre rose pink.

Sex	Length	Height	Diameter	Locality
♂	74 x	62 x	34	(Osage R., Warsaw)
♀	64 x	54 x	31	(" " ")
♂	40 x	37 x	22	(" " Baker)

MISCELLANEOUS REMARKS:—No juveniles of this form are at hand for description. The writer met with this variety in the Osage. It can be easily distinguished from the more typical *coccineum* of South Missouri in not possessing such compression for the posterior half of shell, in being more elliptical and heavier. The general outline is that of *O. ellipsis*. It can be separated from *Pleu. obliquum catillus* by this elliptical shape, but its greater compression (especially posteriorly) and by its thinner, less solid shell. The writer made an interesting discovery while examining a gravid individual of this form afield with a (X12) lens to find its late embryos in rapid rotary motion around one axis. This phenomenon had been observed by the author in *Lastena ohioensis*. A breeding record of this form shows it to be a summer breeder.

Pleurobema catillus (Conrad).

("White Pigtoe," "Pink Pig-toe," "Solid Pig-toe.")

Pl. XX, Figs. 59 A and B.

1836—*Unio catillus* Conrad, Monog. III, p. 30, pl. XIII, fig. 2.1838—*Unio solidus* Lea, Pr. Am. Phil. Soc., VI, pl. V, fig. 13.1845—*Unio fulgidus* Lea, Pr. Am. Phil. Soc., p. 164; Tr. Am. Phil. Soc., X, 1848, p. 73, pl. IV, fig. 10.1900b—*Quadrula solida* Simpson, Pr. U. S. Nat. Mus., XXII, p. 789.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal finely papillose; supra-anal closely connected to anal; gills rather long and wide, the inner being wider and longer, inner laminae free from visceral mass; palpi long and connected about two-thirds of their length antero-dorsad, soft parts tanned flesh-color, yellowish in front of branchial opening, papillae blackish.

REPRODUCTIVE STRUCTURES:—Marsupia only occupying outer gills, ovisacs swollen more centro-lengthwise tapering obtusely at ventral edges; conglutinates leaf-like, compressed white; glochidia semicircular, medium in size, hinge line nearly straight; length and height equal (0.160 x 0.160mm.).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subtriangular with obtusely pointed posterior end, very solid and thick through cardinal hinge region, ventral line always more curved than dorsal; disk smooth, post-umbonal ridge flattened; radial furrow in front rather shallow and wide; beaks full, protruding but not beyond anterior end; epidermis reddish brown with decided streaks of green radiating ventrad from umbonal region.

INTERNAL STRUCTURES:—Cardinals heavy, double in both valves; laterals double in right, single in left valve; interdentum broad, short and thick; umbonal cavities shallow; nacre salmon to rosy pink.

Sex	Length	Height	Diameter	Locality
♂	82	x 65	x 41	(White R., Hollister)
♀	83	x 64	x 40	(Black R., Williamsville)
♂	80	x 63	x 40	(White R., Hollister)

MISCELLANEOUS REMARKS:—Conrad's *catillus* (described as separate from *coccineus* by the author, but united by Simpson) is

the *solidus* of Lea and (in the conventional sense) may be called *Pleu. solidum*. The latter being antedated, we must use the former name. This species is rather typically represented in the Mississippi for Missouri, the mountain streams of South Missouri and also in the Neosho basin of South West Missouri. No real types are ever found in Central Missouri and not even forms are found in North Missouri. This species is distinguished from *Pleu. coccineum* by always being rather swollen and having a radial furrow more or less expressed. In this latter character it never reaches the extreme, as seen in *obliquum*, of the pinched radial groove terminating in sulcus at the post-ventral margin. Its breeding record shows it to be tachytictic.

Pleurobema coccineum (Conrad).

("Flat Nigger-Head," "Pink Pig-toe," "Round Pig-toe.")

Pl. III, Fig. 60b; Pl. XX, Fig. 60 A and B.

1836—*Unio coccineus* Conrad, Monog., III, p. 29, pl. XIII, fig. I.

1900b—*Quadrula coccinea* Simpson, Proc. U. S. Nat. Mus., XXII, pp. 788-789.

1912b—*Pleurobema coccineum* (Conrad) Ortmann, An. Car. Mus., VIII, p. 263.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely set with papillae; anal with indistinct crenulations and papillae; mantle connection between anal and supra-anal very close; gills wide, the inner wider and longer, inner laminae free from visceral mass; palpi long, united two-thirds of their length; color of soft parts tannish, mantle edge at siphonal openings black.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial; when gravid marsupia swell moderately lengthwise in the center; conglutinates white, thin, leaf-shape, discharged whole; glochidia, suboval, spineless, medium in size measure 0.150 x 0.150mm.

SHELL CHARACTERS

EXTERNAL STRUCTURES: Shell subelliptical to subquadrate varying with age, flat, very much compressed through post half, greatly inflated (comparatively) anteriorly, dorsal and ventral margins curved about the same; beaks rather full not very well placed to the front, sculptured by concentric lines with two or

three knotty elevations behind; epidermis marked by darker bands parallel to the growth lines, rayed in young.

INTERNAL STRUCTURES:—Cardinals sharply doubled in both valves; interdentum cut away in the left valve to receive the posterior left cardinal; laterals curved, double in left single in right; umbonal cavity moderately deep; naere salmon pink to white.

Sex	Length	Height	Diameter	Locality
♀	60	x 40	x 24	(White R., Hollister)
♂	75	x 56	x 31	(St. Francis, Greenville)
♀	47	x 40	x 22	(White R., Hollister)

Note that the younger shell is more rounded and squarer, has more of an olivaceous epidermis with green rays; umbonal sculpture plainer with three bumps on base of post-ridge; naere more pearl bluish.

MISCELLANEOUS REMARKS:—This species (*Pleu. coccineum*) is most typically represented in the South and South-west Missouri drainage systems and, while it is not found at all in North Missouri, it is only represented occasionally by mere forms in Central Missouri. It is usually restricted to the smaller streams or to the headwaters of large rivers. Normally, marsupial characters are limited to the outer gills only, although this fact has been denied by some. The writer on one occasion, found this species with all four gills gravid, but in all other cases the outer gills were only found functioning as marsupia. In this species and in some other *Pleurobema*, there may be some variability in this respect. *Coccineum* has a short breeding season as determined by the writer's breeding record.

***Pleurobema missourense* (Marsh).**

("Missouri Shell.")

Not figured.

1901—*Pleurobema Missouriensis* Marsh, Nautilus, XV, pp. 74-75.

ANIMAL CHARACTERS.

Not having seen the soft parts of this species the writer can offer no description. Although the author of *missourense* gave no such description, yet the establishment of this species within the genus *Pleurobema* must have been inferred from these characters.

SHELL CHARACTERS.

Through the kindness of Mr. I. S. Frierson the writer was loaned a shell of this rare species from the original lot, described by Mr. Marsh and collected by Mr. Elwood Pleas in the Black River, Popular Bluff, Butler County, Missouri. From the fact that the writer had but one shell before him, he quotes a more complete description from the author than can be given without a series at hand:—"Shell smooth, obliquely triangular, rounded behind, subbiangular behind, moderately thick, very much thicker anteriorly, sides somewhat flattened, beaks wide, solid, incurved; ligament long, light brown; epidermis light brown, without rays, growth lines numerous, not raised; umbonal slope wide and rather flat; posterior slope wide, flattened with two dark inconspicuous lines running from beaks to posterior margin; beak sculpture unknown; cardinal teeth rather long and solid, depressed, disposed to be double in both valves, corrugate; lateral teeth straight, oblique, corrugate; anterior cicatrices distinct, deep, post cicatrices distinct and well impressed; shell cavity wide and deep; nacre white."

The above description was made from four specimens from young to adult. The young shells are much flatter. The measurement of one of these adult shells is:

Length	Width	Diameter	Locality
66	x 54	x 36mm	(Black R., Popular Bluff)

MISCELLANEOUS REMARKS:—The author of this species states that he knows of no described species which closely resembles it. From the single specimen in hand it seems to be rather intermediate for *P. catillus* and *coccineum*; however, it does not possess the radial furrow of the former nor the rounded and compressed posterior half of the latter. The shell of *missourense* compares well with that of *Fusconaia subrotunda* and if its soft parts could be obtained for study it might be found to be a form of the latter as it is often difficult to separate the species of *Fusconaia* and *Pleurobema* solely on the basis of shell characters. Even from character of shell, Frierson would group this species under *Fusconaia*; however, Walker, who considers this a valid species, would class it near *P. estabrookianum* (Lea).¹

¹ More recently (April, 1915) Mr. Walker determines this species as a *Quadrula* of the *subrotunda* group (Nautilus XXVIII, Pl. V., figs. 1 and 2).

Pleurobema Utterbackii Frierson.² New Species.

Pl. V., Figs. 12 a and b; Pl. XX., Figs. 63 A —D.

ANIMAL CHARACTERS.

"NUTRITIVE STRUCTURES:—Branchial opening with many short antennae; anal very finely crenulated; supra-anal with short but distinct mantle connection to anal; gills long, much pointed posteriorly, inner laminae of inner gills free from visceral mass; palpi wide, short connected about two-thirds of their length antero-dorsad; color of soft parts mostly a light tan, mantle edges at siphonal openings blackish, gills of male and sterile female a darker tan.

"REPRODUCTIVE STRUCTURES:—No gravid females found, but sterile ones only present outer gills as marsupial; sterile marsupia wider with more crowded septa than outer gills of male.

SHELL CHARACTERS.

"EXTERNAL STRUCTURES:—Shell elliptical, somewhat rhomboidal; evenly truncate above posteriorly; beaks at one fourth of their length; epidermis rough, dark reddish brown, faintly rayed when young; post-slope somewhat biangular and low; beaks rather strongly corrugate.

"INTERNAL STRUCTURES:—Cardinals teeth roughish, inclined to be double in both valves; laterals long, medium size; inter-dentum narrow; muscle scars well marked and separate; cavity of shell irregular, that of the beaks of medium depth; nacre white, sometimes pinkish, iridescent behind.

Sex	Length	Height	Diameter	Locality
♀	68	x 42	x 26 mm	(White River, Hollister)
♂	65	x 41	x 25.5 "	(Jack's Fork of Current R.)
♂	18.5	x 12.5	x 7.5 "	(" " " ")
♀	18.0	x 12.5	x 7.0 "	(White R., Hollister)

"Two juvenile shells are at hand measuring as above. Epidermis of latter olive-green, of the former, yellowish, both with fine rays; nacre of latter bluish, of the former pinkish; beak sculpture of both roughly corrugate, the three or four coarse ridges curved up posteriorly into hummocks and directing the apices

² This description of *Pleu. Utterbackii* is quoted from the M. S. of Mr. L. S. Frierson and is kindly permitted to be published here.

of the beaks anteriorly; post-ridge inflated but not so sharply angled as in juveniles of *Fusconaia*, nor so greatly rayed; beak sculpture also different in being more corrugated.

"MISCELLANEOUS REMARKS:—The type shell is from the White River, Hollister, Missouri, collected by Mr. Utterback of St. Joseph, Missouri, for whom the species is named. Other specimens are at hand from contiguous territory. This species might possibly be the *Pleu. argentea*--"*pannosa*" of C. T. Simpson (indicated, but hardly described, in Proc. Nat. Sci. Phil., 1900, p. 82). It is to be differentiated from the Eastern Tennessee *Pleurobema argenteum* (Lea) with difficulty, having its beaks further in front, and higher than in *argenteum*. Specimens have been received under the heterogeneous names of *L. ozarkensis* (Call), *ellipsiformis* (Conrad), etc. But a series of about a dozen sent by Mr. Utterback from two or more localities proves the novelty of the form. The appearances of *Truncilla* and *Pleurobema* in the mountain streams of Arkansas and Missouri, together with an undescribed *Lampsilis* very close to *biangulatus* (Lea), is an interesting and remarkable fact illustrating the power of environmental factors in the family."¹

Genus *Elliptio* Rafinesque.

1819—*Elliptio* Rafinesque, Jour. de Phys. Chim. et His. Nat.

1900b—*Elliptio* Simpson, Proc. U. S. Nat. Mus., XXII, p. 700. (as section.)

1912b—*Elliptio* (Raf.) Ortmann, An. Car. Mus., VIII, pp. 265-272.

(Type, *Unio* [*Elliptio*] *nigra* Rafinesque).

ANIMAL CHARACTERS:—Branchial and anal openings large with many small papillae; mantle connections between anal and supra-anal short, or moderately so; gills wide, very much round

¹ Being more doubted by some students that *P. Utterbackii* may not be distinct from *L. ozarkensis* (Call), Mr. Frierson would make this additional description:—

"Our shell is much more tumid at the beaks, or umbones; it is not furrowed on the post slope by the siphonal ridges as in *ozarkensis*; it is thicker; the anterior muscle scars are distinct, while in *ozarkensis* they are remarkably confluent. Our shell is not dimorphic, while, if Call has not confused two species in one, his species is considerably so. Our shell differs especially from his figures 1 and 3, less so from fig. 4. Our shell has its whole facies of a heavier sort than *ozarkensis*. Our cotypes of the latter, from Mr. Call, are more inclined towards a *Lampsiline* structure, as indeed it is placed by C. T. Simpson."

ventrad, inner wider but not much longer, inner laminae almost entirely free from visceral mass; palpi medium size; color of soft parts whitish suffused with black; only outer gills marsupial; glochidia small, suboval, spineless.

SHELL CHARACTERS:—Shell thick, heavy, subsolid, rhomboid-ovate, longitudinal axis straight, disk smooth, beaks rather low, not near anterior end, sculptured with a few fine concentric ridges angled at the base of the post-umbonal ridge; epidermis brown to black, faintly rayed or rayless; hinge teeth heavy; nacre varying from white to deep purple and violet.

MISCELLANEOUS REMARKS:—This genus falls into two groups for this State. The first group is represented by *E. nigra* (Raf.) which possesses a heavy subquadrate of subtrapzoidal type of shell but with obscure beak sculpture; the second group is represented by *E. dilatata* (Raf.) which has more of an elongate, gibbosed shell with a beak sculpture of thick, heavy, ridges running parallel to the growth lines. The two other groups of this genus (that is, *beadleianus* and *complanatus* groups) are not found in Missouri, the former being mostly a representative of some gulf states and the latter of the immediate Atlantic drainage. Dr. Ortmann used "*Elliptio*" as a generic name available for the "*American Unio*" and employs the original name, "*Unio*," in the sense of the "*European Unio*". The soft parts of this genus being practically indetical with those of the genera immediately preceding, the species are indicated entirely on the basis of peculiar shell characters.

Elliptio nigra Rafinesque.¹

("Elephant's Ear," "Pink.")

Pl. XXI, Figs. 64 and 65 A and B.

1820—*Unio (Elliptio) nigra* Rafinesque, Ann. Gen. Sci. Brux., V, p. 291, pl. LXXX, figs. 1—4.

1823—*Unio cuneatus* Barnes, Am. Jl. Sci., VI, p. 263.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large, well set

¹ Simpson (1900 b, p. 706) applied the name "*Unio crassidens Lamarck*" to *E. nigra* Raf., but as previously stated under the description of *Megaloniais* (IV, p. 124) that close student of Lamarckian types, Mr. Bryant Walker, has settled the question by pronouncing *U. crassidens* (1819) as the so-called *U. trapezoides* of Lea (1831).

with numerous short papillae; anal opening with small, but very distinct, papillae; supra-anal briefly but well connected with anal by mantle edges; gills large, broad, pointed both anteriorly and posteriorly, inner broader, only slightly longer, than outer, inner laminae free from visceral mass; palpi moderately large, connected antero-dorsad, edges curved; color of soft parts dirty white with mantle edges at siphonal openings blackish and gills brownish.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial, when gravid marsupia moderately swollen; conglutinates rather well developed, leaf like, white; glochidia small, suboval, spineless, measures 0.130 x 0.150mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell solid, heavy, subinflated, triangular in outline, post-umbonal ridge prominent; beaks also prominent sculptured by a few rather obscure ridges subparallel to growth lines and swollen at the base of post-ridge; disk more or less smooth; epidermis reddish brown to black often faintly rayed.

INTERNAL STRUCTURES:—Cardinals double in both valves, heavy; laterals heavy; interdentum long; beak cavities large not very deep; nacre (for *Mo. nigra*) only a deep purple—not variable.

Sex	Length	Height	Diameter	Locality
♂	126	x 80	x 51mm	(Miss. R., Hannibal)
♂	91	x 61	x 37 "	(" " ")
♀	115	x 66	x 47 "	(Meramec R., Meramec Highlands)

MISCELLANEOUS REMARKS:—No juveniles, nor young shells found. This is a rare species for the interior of the state being only in the Meramec, outside of the Mississippi River. In the latter, where it is not to say an uncommon shell, it is different from the one found in the Ohio by a variation in nacre-color. The shell may show some variation in size and form in the same river, as Wilson and Clark (1914, p. 42) observed in the Cumberland where it is short and chunky in the headwaters but is heavier and more elongate in the lower stretches. Although *nigra* is essentially a big river species, yet it is not found in the Osage—the largest Missouri River tributary. Its occurrence in the Meramec carries it farther west than recorded before. Its breeding record, although incompletely kept by the writer, shows it to be a tachytetic *Unio*.

***Elliptio dilatata* (Rafinesque).**

("Lady Finger," "Spike," "Pistol Grip.")

Pl. XXI, Figs. 66 A' and B.

- 1820—*Unio (Elliptio) dilatata* Rafinesque Monog. of Bivalves of Ohio, Ann. Gen. Sci. Phys. Brux.
 1823—*Unio gibbosus* Barnes, Am. Jl. Sci., VI, p. 262, pl. XI, fig. 12.
 1838—*Unio arctior* Lea, Tr. Am. Phil. Soc., VI, p. 10, pl. IV, fig. 10.
 1912b—*Elliptio gibbosus* (Barnes) Ortmann, An. Car. Mus., VIII, p. 271.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening small with many short, blackish papillae; anal with a single row of low papillae; supra-anal separated from anal by short mantle connection; gills long and narrow, inner laminae of inner gills free—in some instances connected about one-fourth of the way anteriorly; palpi short, wide, connected antero-dorsad about two-thirds of their length; color of soft parts soiled grayish with area in front of branchial opening yellowish, pericardianl region invariably reddish brown.

REPRODUCTIVE STRUCTURES:—Only outer gills are marsupial, marsupia moderately swollen in center when gravid, dark tan; conglutinates narrowly lanceolate, always whitish; glochidia medium size, spineless, hinge line slightly depressed, measure 0.200 x 0.220mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES: Shell elongate-ellipsoid, gibbose, thick heavy, post-umbonal ridge rounded, inflated; disk smooth; beaks flattened, coarsely sculptured with five or six wavy ridges more pronounced behind; epidermis dark brown to horn or yellowish.

INTERNAL STRUCTURES:—Cardinals rather low, double in both valves; laterals double in left and inclines to double in right valve; interdentum very long, cut away in right to receive left post-cardinal; umbonal cavities rather shallow; however, deeper in female shell; nacre mostly dark purple, varies from all shades of purple to salmon and white.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	135	x 65	x 43.0	0.260	(Miss. R., Hannibal)
♂	120	x 50	x 38.0	0.255	(Osage R., Osceola)
♀	42	x 20	x 9.5	0.255	(" " ")
♂	39	x 18	x 9.5	0.250	(Niangua R., Hahatonka)

The last two measurements are those of the most adolescent shells at hand but are not young enough to present much additional information than can be obtained from the mature shell.

MISCELLANEOUS REMARKS:—This is one of the species of very wide geographic distribution in United States but is limited in this state for the interior to those streams south of the Missouri River where it is met with in a multitude of forms—especially of the small thin and compressed varieties found in the Ozarkan streams of South Missouri. In the Osage it is found most typically, aside from the Mississippi which produces the best types of all *Naiad* species. The depauperization of this species in size and form in the mountain streams is evidently due to a swifter current and hence these dwarfed forms may be merely a local ecologic race that may not deserve special names; however, two forms in this state occur often enough to require some little attention. *Dilatata* (Raf.) (= *gibbosus* (Bar.)) is more confused with *Ellipsaria clintonensis* (Simpson) than with any other shell. There is a difference, however, in the latter possessing capillary rays, and a broader interdentum, but the best distinction is in the marsupial structures of the latter that presents a folded appearance, when gravid. Simpson did not know the difference from shell structures until he found a gravid *clintonensis*. While this species is both lacustrine and fluviatile, yet it is never found in any lake or pond in this state. The typical *dilatata* with white nacre (*E. arctior*) is simply put down in the synonymy. A form like Conrad's *U. arcus* is sometimes found in the Osage but aside from its shortened dwarfed form of shell it does not even possess enough differentiating characters to give it a varietal place. The writer has found it to be gravid only from June to August; hence tachytictic.

***Elliptio dilatata subgibbosa* (Lea).**

("Little Lady Finger," "Little Spike.")

Pl. XXI., Figs. 68 A—D

1857—*Unio subgibbosus* Lea, Pr. Ac. N. Sci. Phila., IX, p. 169; 1858, Jl. Ac. N. Sci. Phila., IV, p. 53, pl. VI, fig. 36.

1868—*Unio lazarus* Sowerby, Conch, Icon., XVI, pl. LXVIII, fig. 348.

ANIMAL CHARACTERS:—Absolutely identical with those of the parent. No real difference in glochidial characters even.

SHELL CHARACTERS:—Moderately small, short, rather inflated, somewhat heavy through the post-ridge, more elliptical,

not so pointed posteriorly, older shells tending toward post-dorsal truncation, dorsal line arched, ventral rather straight, epidermis brownish; nacre white with pinkish umbonal cavity or solid color.

Sex	Length	Height	Diameter	Locality
♀	70	x	30 x 20mm	(Black R., Williamsville)
♂	56	x	26 x 13 "	(" " " ")
♀	46	x	23 x 12 "	(" " " ")

MISCELLANEOUS REMARKS:—Specimens collected from streams in Stone County have been sent to the Division of Mollusks in the National Museum where they were identified as *subgibbosus*. It has also been reported from the streams of Texas and Shannon Counties. It is different from the variety *delicatus* of Simpson by being somewhat larger, not so thin-shelled, more arched dorsad, more pointed both anteriorly and posteriorly, with rather prominent post-umbonal ridge. This variety is rather common in the Black and St. Francis drainage.

***Elliptio dilatata delicata* (Simpson).**

("Little Lady Finger.")

Pl. XXI., Figs. 68 A—D.

1900b—*Unio gibbosus delicatus* Simpson, Proc. U. S. Nat. Mus., XXII, p. 704.

ANIMAL CHARACTERS:—Although the anatomy of this variety is smaller than the parent, yet it is precisely identical. Only sterile individuals found; however, only outer gills marsupial.

SHELL CHARACTERS:—Shell greatly compressed, very small, thin, outline evenly elliptical; epidermis brownish red to olivaceous; hinge teeth rather prominent, thin, nacre purple or coppery-rarely white.

Sex	Length	Height	Diameter	Locality
♂	55	x	26 x 13 "	(White R., Hollister)
♀	48	x	24 x 11 "	(" " " ")
♂	43	x	21 x 10 "	(" " " ")

MISCELLANEOUS REMARKS:—The writer has in his collection a shell of this subspecies bearing the original label of Mr. Simpson, the author. The *dilatata* shells of the White River compare well to it. For the same ecologic reason we may account for this small form in the South Missouri drainage as well as for the occurrence of *subgibbosa*. These two forms are not found north of the Ozark divide, neither is the typical *dilatata* of Rafinesque found south of it in this State showing the ready response of the parent species to different environmental conditions.

Genus *Uniomereus* Conrad.

1853—*Uniomereus* Conrad, Proc. Ac. Nat. Sci. Phila, VI, p. 268. (as genus).

1900b—*Uniomereus* (Conrad) Simpson, Proc. U. S. Nat. Mus., XXII, p. 739 (as section).

(Type, *Unio tetralasmus* Say).

ANIMAL CHARACTERS:—Both branchial and anal openings papillose and crenulate; supra-anal closely and loosely connected to anal; inner laminae of inner gills free from the visceral mass almost their full length; papli short almost as wide as long; color of soft parts mostly a soiled white, gills brownish; gills only marsupial in outer ones, when gravid rather distended lengthwise in center, tapering at the ventral edge, ovisacs not divided; septa wavy; conglutinates white, sole-shaped; glochidia medium in size, semielliptical, higher than long, hinge line straight.

SHELL CHARACTERS:—Shell trapezoidal, rather obtusely pointed behind; disk smooth with the exception of roughened growth lines; beaks low, sculptured with several coarse concentric ridges which curve abruptly upward behind where they are crowded closely together; epidermis rayless, shiny, yellowish to black; cardinals compressed; laterals nearly straight; nacre whitish to bluish.

MISCELLANEOUS REMARKS:—Dr. Ortmann elevates *Uniomereus* from Simpson's treatment of it as section mostly because of the peculiar beak sculpture of its type since this character alone is a great departure from the *Elliptio*-shell (See Plate xxi, fig. 69). Then, too, the shell is thinner, has more of a rayless, vari-colored polished epidermis and is more elongated with less curved dorsal or ventral line.

OUR BIRDS IN THE SUMMER OF 1914.

BY BROTHER ALPHONSUS, C. S. C.

In this article I have recorded the more interesting of my observations made during the summer of 1914, in the hope that they may be found serviceable especially to students of bird life who may not have equal opportunities to observe birds in their native haunts. Very few persons, like the writer, can find

time for daily observations, and these may often wish for first-hand information which may answer many questions that they can not answer themselves.

Another advantage to be gained by recording the facts that are furnished by frequent observations of our birds is the accumulation of data for a fuller life history of the different species in a particular locality. And the element of time is not the least important in these records—such as the time of nesting; when the young are fledged; dates of the first and last brood of certain species; habits of species at different periods, etc. Lastly, the writer's privilege of visiting deep woods in August, which few observers near cities can enjoy, has revealed a number of interesting ornithological secrets.

Daily observations also disclose some interesting facts about species that are very rare during certain seasons of the year. In 1914 species that were seen not oftener than three times in one or more of the summer months were: Least Flycatcher, Night-hawk, Scarlet Tanager, Red-eyed Vireo, Purple Martin, Redstart, Black-billed Cuckoo, Cardinal, Hummingbird, Savanna Sparrow, Phoebe, Bobolink, Blue Jay, Bronzed Grackle, Crested Flycatcher, Loggerhead Shrike, Black and White, Canadian, Pine, Black-throated Green, Nashville, Magnolia, Yellow, Warblers.

The Crow had the fewest records in June of any month of the year, both in 1914 and 1913—13 for the former and 12 for the latter. In 1914 the longest interval between any of the dates was 7 days; in 1913, 4 days. In July there were 29 records for 1913 and 20 for 1914. In August, 1914, the only day the species did not appear was on the 2d; in 1913, there were 6 days in August when the Crow was not found.

In June the Blue Jay maintained a better showing than the Crow—17 records for 1913 and 22 for 1914. In both years the longest absence was 4 days. In July 1914 there were four days when the species was not seen; in 1913 there were no records for the Jay. The writer spent July at Bankson Lake, near Lawton, Mich. In August there were 9 records in 1913, made at Notre Dame, Indiana, and none before the 11th of the month, when the writer was in Michigan. In August, 1914 there were but two records—made in Indiana. As reported in a previous article, the Blue Jay was found formerly in small numbers at Bankson Lake,

but the records of the past three years indicate that the species has permanently departed from this vicinity.

In June, 1914 the White-breasted Nuthatch was recorded on four days, after the 24th; in 1913 there were 7 records—all after the 19th. The migration of the species during the nesting season has been quite regular for the last ten years, only rarely has an individual been found nesting at Notre Dame. Who will give a satisfactory explanation of the spring migration of this Nuthatch?

The Bluebird had 7 records in June 1914 and 1913. In July 1914 there were also 7 records; in 1913, 28 records were made at Bankson Lake. In August there were 29 records in 1914 and 20 in 1913, the larger record being made in Michigan. These records clearly show that a favorable locality will make a marked difference in the number of records of certain species.

June 1, 1914.—Young Thrasher flying; tails short.—June 9.—Flicker feeding young in nest; young birds, noisy.—First note of young Baltimores.—June 15.—Families of Blue Jays and Phoebe's.—June 17.—A male Cardinal bathing at the edge of a small lake; another flew out of a nearby willow tree. Both flew toward a swamp not far away, and one began to whistle continuously.—June 19.—Young Robins plentiful near a lake; Bronzed Grackles numerous in an oak grove.—June 20.—A Crow attacked by a Baltimore Oriole; young Baltimores out of nest; nearly full grown.—June 21.—Song Sparrow's nest on ground in tall grass;—three eggs, one darker than the others at the larger end; bird flew off the nest as I approached.—June 24.—A Towhee with an unmusical note at top of tall tree.—June 25.—Orchard Oriole's nest in spruce tree; female feeding young; young calling constantly.—June 26.—Cowbirds in a large flock in a field.—June 29.—Young Chipping Sparrow flying.

July 3, 1914.—Red-shouldered Hawk attacked by a Red-winged Black bird.—July 5.—Two Savanna Sparrows feeding in grass and a walk near a lake.—July 9.—Two young Kingbirds resting on a dead branch of a tree growing on a small island; old birds flying from same tree.—Young Red-headed Woodpecker; first seen this year.—Young Robins and Flickers very plentiful near the shore of a small lake.—July 11.—A Hummingbird resting on a dead twig in an apple tree; kept turning its head; flew away in a minute.—July 12, 7:45 p. m.—Swift entering a chimney.—July 18.—Note of Cardinal and Purple Martins near St. Joseph

River.—July 24.—Meadowlarks singing loud, but not long.—July 25.—Catbird still in full song; few notes of a Thrasher.—July 26.—Gnatcatcher at the edge of a wood near St. Joseph River.—July 28, 4:30 p. m.—A Cardinal singing long; Orchard Orioles plentiful,—near St. Joseph's River.

August 3, 1914.—Arrived at Bankson Lake near Lawton, Mich.—Aug. 5.—A young Robin just able to fly, in an oak grove.—Aug. 6.—Sandhill Crane flying over the lake.—Arcadian Flycatcher in deep woods.—Aug. 7.—Red-headed Woodpeckers plentiful in open woods near the lake; not in deep woods at all.—Deep woods.—Call-note of Scarlet Tanager; notes of Yellow-throated Vireo; first time heard this year.—Aug. 8.—Deep woods.—Tanager in full song; scarlet on belly fading.—Sandhill Crane flew from perch in a tree.—Aug. 10.—Deep-woods.—First Warblers arrived.—Aug. 11.—Young Tanager—yellowish beneath; wings and tail becoming black.—Aug. 15.—Bobolinks in a field and in bushes—near a pond; in autumn plumage; call-note musical; a good-sized flock—25 or 30.—Aug. 16.—Cedarbirds on grape vine. Other birds also eating grapes; such as, Baltimore Orioles, Catbirds.—Aug. 24, A. M. and P. M.—Warblers in force.—Aug. 30.—Loggerhead Shrike in a lane in a pasture; perched on fence posts and wire; flew ahead of me as I approached, but allowed me to come very close before flying; first seen this summer.

JUNE.

Crow, 1, 2, 4, 8, 16, 17, 19, 20, 22, 25, 26, 28, 30.	Robin, 1 to 30.
Blue Jay, 1, 2, 3, 6 to 9, 14 to 18, 20, to 25, 27 to 30.	Bluebird, 1, 2, 3, 15, 18, 20, 22.
Goldfinch, 1 to 4, 6 to 12, 14 to 25, 27 to 30.	Killdeer, 1 to 5, 7, 8, 9, 12, 14, 19, 20, 24, 25, 27, 30.
White-breasted Nuthatch, 24, 25, 28, 30.	Bronzed Grackle, 1 to 13, 15 to 30.
Song Sparrow, 1 to 30.	Cowbird, 1 to 25, 27 to 30.
Vesper Sparrow, 1 to 4, 6 to 30.	Red-winged Blackbird, 1 to 13, 16, 17, 19, 20 to 26, 28, 29.
Field Sparrow, 1 to 30.	Kingfisher, 5, 8, 10, 12, 14, 15, 17, 19 to 22, 24, 25, 27, 28, 30.
Chipping Sparrow, 1, 3 to 19, 21 to 30.	Mourning Dove, 1 to 5, 8 to 30.
Meadowlark, 1 to 30.	Towhee, 14, 20, 21, 24, 26 to 29.
	Brown Thrasher, 1, 2, 3, 5 to 8, 10 to 13, 15 to 21, 23 to 30.

- Flicker, 1 to 30.
 Catbird, 1 to 4, 6 to 30.
 Barn Swallow, 1, 4, 6, 7, 12, 17,
 20, 22, 27, 29, 30.
 Spotted Sandpiper, 1, 2, 3, 6, 8
 to 14, 16, 17, 18, 21, to 26,
 28, 29, 30.
 Baltimore Oriole, 1 to 30.
 Orchard Oriole, 1 to 30.
 House Wren, 1 to 30.
 Chimney Swift, 1 to 30.
 Kingbird, 1 to 30.
 Wood Pewee, 1 to 30.
 Crested Flycatcher, 1, 2, 3, 5, 6,
 8 to 15, 18, 19, 21, 22, 25 to
 30.
 Least Flycatcher, 24.
 Alder Flycatcher, 2, 3, 4, 10.
 Nighthawk, 30.
 Scarlet Tanager, 17.
 Warbling Vireo, 1 to 30.
 Red-eyed Vireo, 1, 29.
 Indigo Bird, 1, 2, 6 to 10, 12,
 13, 14, 17 to 22, 24 to 27,
 29, 30.
 Bobolink, 14, 19, 21, 24.
 Dickcissel, 1, 2, 4, 6 to 10, 12,
 19, 22, 26, 27.
 Purple Martin, 21
 Yellow-billed Cuckoo, 1, 2, 3, 6,
 8, 9, 11 to 16, 18, 19, 21 to 30.
 Black-billed Cuckoo, 24.
 Cedarbird, 1, 2, 3, 4, 6 to 19,
 21 to 25, 28.
 Hummingbird, 17.
 Redstart, 4.
 Maryland Yellowthroat, 1, 2, 3,
 4, 6 to 11, 13, 16 to 26, 29.
 Red-headed Woodpecker, 1 to
 17, 19 to 24, 26 to 30.
 Downy Woodpecker, 1, 20, 21,
 24.
 Hairy Woodpecker, 18, 19, 24.
 Cardinal, 7, 17, 29.

Total number of species seen, 52.

JULY.

- Crow, 2 to 5, 9, 10, 11, 15, 16,
 18, 19, 20, 22, 24, 26 to 31.
 Blue Jay, 1 to 11, 14, 15, 17,
 18, 20 to 31.
 White-breasted Nuthatch, 2 to
 7, 9, 10, 11, 13 to 17, 20 to 24,
 30, 31.
 Red-headed Woodpecker, 1 to
 31.
 Downy Woodpecker, 2, 5, 7, 8,
 11, 12, 14, 15, 20, 22, 23, 24,
 26 to 30.
 Savanna Sparrow, 5
 Song Sparrow, 1 to 31.
 Vesper Sparrow, 1 to 11, 13 to
 16, 18 to 31.
 Field Sparrow, 1 to 31.
 Chipping Sparrow, 1 to 18, 20
 to 30.
 Meadowlark, 1 to 15, 17, 19,
 20, 22, 23, 24, 26, 29.
 Robin, 1 to 31.
 Bluebird, 3, 15, 16, 20, 23, 26, 28.
 Killdeer, 1, 2, 4, 6, 7, 9, 10, 13,
 15, 18, to 22, 25, 28, 30.
 Bronzed Grackle, 1 to 31.
 Cowbird, 1 to 13, 15, 16, 18,
 21, 23, 24, 26 to 29.

- Red-winged Blackbird, 1 to 7,
9 to 13, 15 to 18, 21, 23, 24,
26, 29, 30.
- Kingfisher, 2, 3, 5, 7, 8, 9, 12,
15, 16, 18, 20 to 27, 30, 31.
- Mourning Dove, 1 to 31.
- Red-shouldered Hawk, 3, 24.
- Towhee, 1, 3, 7, 9, 12, 14, 25, 27,
29, 30.
- Flicker, 1 to 31.
- Brown Thrasher, 1 to 12, 14
to 25, 27 to 30.
- Catbird, 1 to 31.
- Barn Swallow, 2, 5, 15, 20, 22,
23, 31.
- Spotted Sandpiper, 1, 2, 3, 4, 5,
11, 15, 18, 20, 23, 28.
- Baltimore Oriole, 1 to 31.
- Orchard Oriole, 1 to 12, 14 to
21, 24, 27 to 30.
- House Wren, 1 to 31.
- Chimney Swift, 1 to 21.
- Kingbird, 1 to 31.
- Wood Pewee, 1 to 31.
- Phoebe, 4, 5.
- Crested Flycatcher, 1, 2, 3, 8
to 16.
- Alder Flycatcher, 10, 15, 16,
19 to 22, 24 to 27.
- Nighthawk, 1.
- Indigo Bird, 1 to 24, 26 to 30.
- Warbling Vireo, 1 to 31.
- Bobolink, 1, 2.
- Purple Martin, 18 19, 24, to
27, 29.
- Yellow-billed Cuckoo, 1 to 6, 11,
12, 15 to 24, 26 to 31.
- Cedarbird, 1, 3, 4, 5, 11, 13, 15,
16, 20, 24, 26, 27, 28.
- Hummingbird, 11, 14, 20, 23.
- Maryland Yellowthroat, 5, 7, 8,
10, 14, 16 22 to 27, 30.
- Cardinal, 18, 28, 29.
- Bobwhite, 8 12.
- Lesser Yellowlegs 22, 24, 26, 30.
- Sandhill Crane, 26.
- Goldfinch, 2 to 31.
- Gnatcatcher, 27 28, 29.
- Screech Owl, 20, 31.

Total number of species seen, 51.

AUGUST.

- Crow, 1, 3, 4 to 31.
- Blue Jay, 1, 2.
- White-breasted Nuthatch, 1, 3,
4 to 16, 18 to 31.
- Red-headed Woodpecker, 1 to
4, 6 to 12, 14 to 31.
- Downy Woodpecker, 1, 2, 4 to
10, 12 to 16, 18 to 20, 22 to
24, 26 to 29, 31.
- Hairy Woodpecker, 10 30.
- Goldfinch, 1 to 31.
- Song Sparrow, 1 to 22, 24 to 31.
- Vesper Sparrow, 6, 29, 31.
- Field Sparrow, 1 to 31.
- Chipping Sparrow, 1 2, 4 to
27, 29, 30, 31.
- Savanna Sparrow, 13, 19, 27.
- Swamp Sparrow, 13, 30.
- Robin, 1 to 18, 20 to 31.
- Bluebird, 1, 3, 4 to 9, 11 to 31.
- Killdeer, 1, 3, 4, to 11, 21, 22,
24, to 31.
- Bronzed Grackle, 1, 2, 3.
- Cowbird, 1, 11, 13, 14, 15.
- Red-winged Blackbird, 1, 4 to
8, 11, 12, 18, 22, 24, 27.

- Kingfisher, 4 to 31.
 Mourning Dove, 1 to 4, 6, 8, 10,
 15, 16, 18, 21, 22, 24, 25, 27,
 29, 30.
 Towhee, 7, 18, 26, 27.
 Flicker, 2, 4 to 8, 10 to 13, 15
 to 20, 22 to 31.
 Brown Thrasher, 1, 2, 11.
 Catbird, 1 to 9, 11, 14 to 18,
 20, 24 to 27, 29, 30.
 Spotted Sandpiper, 3 to 7, 10, 12,
 13, 15 to 25, 28, 29, 31.
 Orchard Oriole, 1, 5, 6, 7, 8, 10.
 House Wren, 1, 2, 3, 29, 31.
 Chimney Swift, 1, 2, 15, 16.
 Kingbird, 1 to 21, 24 to 26, 28,
 30, 31.
 Wood Pewee, 1 to 31.
 Phoebe, 3, 4, 6, 9, 10, 12, 14,
 21, 23, 24, 25, 27, 29, 31.
 Crested Flycatcher, 19, 24.
 Least Flycatcher, 11, 15, 21, 29.
 Alder Flycatcher, 4, 5, 6, 7, 9, 10.
 Acadian Flycatcher, 5 to 14, 16,
 17, 19, 20, 21, 22, 26, 27, 31.
 Gnatcatcher, 27, 28, 29, 30, 31.
 Indigo Bird, 1, 3 to 14, 16, 17,
 18, 21, 22, 24 to 27, 29, 30, 31.
 Warbling Vireo, 1 to 9, 11, 12,
 14, 15, 17, 18 to 22, 24 to 31.
 Red-eyed Vireo, 3 to 12, 14, 16
 to 22, 24 to 31.
 Yellow-throated Vireo, 7, 14,
 18, 22, 24, 26, 28, 31.
 Bobolink, 15, 19 to 22, 24 to
 28, 30.
 Purple Martin, 12.
 Black-billed Cuckoo, 26.
 Yellow-billed Cuckoo, 2, 4, 6, 7,
 8, 10, 11, 12, 14, 16 to 19,
 22 to 25, 29, 30.
 Cedarbird, 6, 8, 11, 12, 16, 17,
 19, 22, 24 to 29, 31.
 Hummingbird, 1, 2, 3, 26, 27, 30.
 Scarlet Tanager, 5, 7, 8, 11, 26.
 Great Yellowlegs, 5, 12, 13, 16,
 24, 25, 29, 31.
 Lesser Yellowlegs, 2, 3, 4, 6, 7,
 8, 10, 11, 12, 14 to 18, 20, 21,
 22, 24 to 31.
 Hell Diver, 5 to 12, 14 to 22,
 24, 25, 26, 28, to 31.
 Sandhill Crane, 6, 7, 8, 12 to
 15, 17 to 21, 23 to 26, 28, 30.
 Screech Owl, 4, 7, 8, 9, 25.
 Eave Swallow, 3 to 6, 9 to 21,
 25, 26, 29, 30.
 Tree Swallow, 5, 7, 9, 13, 15.
 Loggerhead Shrike, 30.
 Yellow Warbler, 4, 5, 8.
 Black and White Warbler, 10,
 31.
 Black-throated Green Warbler,
 11, 31.
 Canadian Warbler, 24.
 Pine Warbler, 24, 27.
 Blackburnian Warbler, 24, 25,
 30, 31.
 Nashville Warbler, 24, 26, 30.
 Magnolia Warbler, 26, 28.
 Overbird, 24.
 Redstart, 10.
 Sparrow Hawk, 21, 31.
 Red-shouldered Hawk, 3, 4, 6,
 8, 9, 11, 12, 14, 16, 19, 24
 to 31.
 Chickadee, 4 to 8, 10 to 12, 14
 16, 18, 20 to 27, 30, 31.

Total number of species seen, 69.

Total number of species seen during summer, 75.

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—II.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—II.

With Notes by J. Lunell.

Order 8. GLUMIFLORAE.

[Lobelius. Hist. 1, (1576).] [He has *Carices* and *Gramina* together in his treatment, though he has no name for the group.]
C. A. Agardh, Aphor. 139. (1823).

Graminales Britton, Man. 60. (1901).

Family 13. **CULMIFERAE** Ray, Meth. 147. 149 (1682).

Gramineae B. Juss. Hort. Trian. ex A. Juss. Gen. LXIV et 28. (1789). *Gramina* Hall. Enum. Stirp. Helvet. 1, 203 (1742).
Linn. Phil. Bot. 28, (1751). *Graminia* Dum. Agrost. Belg. 79. (1823).

Tribe I. **MAYDEAE** Dumortier B. C. Observations sur les Graminées 84. 90. (1823) Agrostographia Belgica, Tent.

MAYS Acosta, Tract. Drog. (1578).

Maiz Caesalpinus De Plantis 181. (1583), Cam. Hort. Med. 94. (1588). *Maizum* Monardes ex C. Bauhin. Pin. 25. (1623).
Maizium et *Maizum* Dodonaeus, Herb. 822. (1618). *Mays* Tour. Éléms 423 (1694). I. R. H. 531. (1700). *Zea* Linn. Gen. 279 (1737), 419. (1754). *Thalysia* Linn. Syst. (1735)! also Fund. Bot. 244. *Zea* Fund. Bot. 242.—Not *Zea* or *Zeia* Dioscorides = *Triticum Spelta* Linn.

49. **Mays Acostae** Tour. Éléms. 1. c. (1694).

Zea Mays Linn. Sp. Pl. 971. (1753).

Occasionally escaping. Leeds.

Tribe II. **ANDROPOGINEAE** Dum. Obs. Gram. et Agrost. Belg. 84. (1823).

Andropogoneae J. Presl. et C. Presl. Rel. Haenck. I. 331. (1830).

ANDROPOGON Royen Fl. Leyd. Pr. 52. (1740).

Andropogon Linn. Gen. 468. (1754).

50. **Andropogon scoparius** Michx. Fl. Bor. Am. I. 57. (1803).
Leeds, Towner, Butte.

51. **Andropogon Hallii** Hack. Sitz. Acad. Wiss. Wien. 89. 127. (1884).

Morton Co.: Pretty Rock (Bell); Pleasant Lake.

52. **Andropogon furcatus** Muhl. Willd. Sp. Pl. 4:919. (1806).
Leeds, Butte, Minot, Des Laes.

CHALCOELYTRUM Lunell, nom. nov. (from χαλκός copper, and ἔλυτρον, husk, alluding to the copper-tinted glumes of the spikelets).

Chrysopogon Trin. Fund. Agrost. 187. (1820). *Sorghastrum* Nash, Britt. Man. 71. (1901), name built on *Sorghum* and just as cheap and undesirable as diminutives in *ella*.

53. **Chalcoelytrum nutans** (Linn.) Lunell.

Sorghastrum nutans (Linn.) Nash, in Small, Flor. South-eastern U. S. 66. (1903).

Sorghum avenaceum (Michx.) Chapm. Fl. S. States 583. (1860).
Butte, Towner.

Tribe III. **PANICEAE** Dum. Obs. Gram. et Agrost. Belg. 83. (1823).

MILIUM Plinius 18:7. Virgilius, Georg. 1:216 Colum. 2.7.9. Cels. 2.18. Palad. 1:30 = *Panicum miliaceum* Linn. Sp. Pl. 58 (1753) = type of what we now call *Panicum* Linn. (restricted genus of the manuals) = *Chasea* Nwd. Am. Midl. Nat. Vol. II., p. 64 (1911).—This is *Milium* Moench. Meth. 202 (1794) inclusive of *Echinochloa* Beauv. Agrost. 53. (1812). Another synonym is *Cenchrus* Hippocrates Morb. 1. 619.

54. **Milium capillare** (Linn.) Moench l. c. 203.

Panicum capillare Linn. Sp. Pl. 58. (1753).
Leeds.

55. **Milium barbipulvinatum** (Nash.) Lunell.

Panicum barbipulvinatum Nash. Mem. N. Y. Bot. Gard. Vol. I: 21. (1900).

Leeds, Devils Lake, Bismarck.

56. **Milium panicum** Mill. Gard. Dict. No. 1 (1759).

Panicum miliaceum Linn. Sp. Pl. 58. (1753).

Milium esculentum Moench. Meth. 203 (1794).

Fargo (Bergman et Stevens); Leeds.

57. **Milium virgatum** (Linn.) Lunell.

Panicum virgatum Linn. Sp. Pl. 59 (1753).

Leeds, Bismarck.

58. **Milium virgatum elongatum** (Vasey) Lunell.

Panicum virgatum elongatum Vasey, Bull. Torr. Bot. Club,

13: 26. (1886).

Leeds.

59. **Milium Leibergii** (Vasey) Lunell.

Panicum Leibergii (Vasey) Scribn. in Britton and Brown, Illustr. Fl. 3: 497. (1898).

Panicum scoparium Leibergii Vasey, U. S. Dept. Agric. Div. Bot. Bull. 8: 32. (1889).

Butte, Oberon.

60. **Milium Wilcoxianum** (Vasey) Lunell.

Panicum Wilcoxianum Vasey l. c.

Butte, Towner; Kuhn (Brenckle).

ECHINOCHLOA Beauv. Agrost. 53. t. 11. (1812). *Milium Moench*, in part.

61. **Echinochloa Crus-galli** (Linn.) Beauv. l. c. *a submutica* (Neilr.) Beck v. M., in Neuman, Sveriges Fl. p. 777. (1901).

Panicum Crus-galli Linn. Sp. Pl. 56. (1753), in part.

Leeds.

62. **Echinochloa Crus-galli** (Linn.) Beauv. l. c. *β aristata* (Rehb.) Beck v. M., Neuman l. c.

Panicum Crus-galli Linn. l. c., in part.

Leeds, Bismarck.

63. **Echinochloa frumentacea** (Roxb.) Link.

Panicum frumentaceum Roxb., Japanese Barn-yard Millet, or Billion Dollar Grass, an occasional escape from cultivation. Vide Gray's Manual Ed. VII. p. 117. (1908).

In roadside ditch, Towner.

PANICUM (Plinius) Linn. Sp. Pl. 55. (1753).

Setaria Beauvais, Agrost. 112 (1812), not Aschers. 1798.

Ixophorus Schlecht, Linnaea 31. 420. (1861-2).

Chamaeraphis R. Br. (1810) O. Kuntze (1891).

Chaetochloa Scribn. U. S. Dept. Agr. Bull. Agrost. 14. (1877).

64. **Panicum italicum** Linn. Sp. Pl. 56. (1753).

Setaria italica R. and S. Syst. 2: 493. (1817).

Chamaeraphis italica Kuntze, Rev. Gen. Pl. 768. (1891).

Ixophorus italicus Nash. Bull. Torr. Club. 22: 423. (1895).

Chaetochloa italica Scribn. l. c. 4: 39. (1897).

Leeds.

65. **Panicum viride** Linn. Sp. Pl. 2: 83, (1762).

Setaria viridis Beauv. Agrost. 51. (1812).

Chamaeraphis viridis Porter. Bull. Torr. Club 20: 196. (1893).

Ixophorus viridis Nash. Bull. Torr. Club. 22. 423. (1895).

Chaetochloa viridis Scribn. U. S. Dept. Agric. Div. Agrost. Bull. 4: 39. (1897).

Leeds.

66. *Panicum lutescens* Weigel Obs. Bot. 20. (1772).

Chaetochloa lutescens (Weigel) Stuntz, U. S. Dept. Pl. Ind. Seeds 33:36. 1914.

Chaetochloa glauca of recent authors.

Not *Panicum glaucum* Linn., which acc. to Stuntz is pearl millet, *Pennisetum americanum* (Linn.) Schum.

Cass Co.: Harwood (Bergman).

NASTUS Dioscorides I:114 = *Cenchrus frutescens* Linn. Bubani in Fl. Pyr. IV. (1901) takes up the name. Not *Cenchrus* Hippocrates l. c. *Panicastrella* Micheli, Nov. Pl. Gen. 36. (1719) an ugly diminutive of *Panicum*, taken up by Moench. *Echinaria* Heist. Syst. Pl. Gen. 12. (1748).

67. *Nastus carolinianus* (Walt.) Lunell.

Cenchrus carolinianus Walt. Fl. Car. 79. (1788).

Cenchrus tribuloides Am. authors, not Linn.

Bismarck.

Tribe IV. *ORYZAE* Dum. Obs. Gram. et Agrost. Belg. 83. (1823).

CERATOCHAETE Lunell, nom. nov. (from *κέρας*, a horn, and *χαίτη*, a bristle, named in reference to the long, stiff awns in the pistillate spikelets).

Zizania Linn. Sp. Pl. 991. (1753), not *Zizania* of the New Testament, which is *Lolium temulentum*.

68. *Ceratochaete aquatica* (Linn.) Lunell.

Zizania aquatica Linn. Sp. Pl. l. c.

In James River at Jamestown.

LEERSIA Sw. Nov. Gen. et Sp. 21. (1788).

Homalocenchrus Mieg.; Hall. Hist. Stirp. Helv. 2: 201. (1768).

A. poor name.

69. *Leersia oryzoides* (Linn.) Sw. Fl. Ind. Occ. I:132. (1797).

Phalaris oryzoides Linn. Sp. Pl. 55. (1753).

Homalocenchrus oryzoides (Linn.) Poll. Hist. Pl. Palat. 1: 52. (1776).

Jamestown.

Tribe V. *PHALARIDEAE* Link. Hort. Berol. I:62. (1827).

PHALARIS Dioscorides 3: 149. Plinius 27: 12 et 102.

Also *Tragus*, *Matth*, *Anguillara*, *Turner*, *Dodonaeus*, *V. Cordus*, *Gesner*, *Lobelius*, *Caesalpinus*, etc.

70. *Phalaris arundinacea* Linn. Sp. Pl. 55. (1753), also Linn. Pan. Swan. Am. Acad. 2:38. (1751).

Leeds, Butte; Kulm (Brenckle).

71. *Phalaris canariensis* Linn. Sp. Pl. 54. (1753).

Seems to be the type of the genus as held by prae-Linnaeans. *Dodonaeus* says it is called "Canary-seed." Hence the specific name.

In waste places. Towner.

HIEROCHLOE J. G. Gmel. Fl. Lib. 1: 101. (1747).

Savastana Schrank, Baier. Fl. 1: 100. (1789).

72. *Hierochloe odorata* (Linn.) Wahlenb. Fl. Uyss. p. 32. (1820.)

Holcus odoratus Linn. Sp. Pl. 1048 (1753).

Hierochloe borealis R. S. Syst. 2: 513. (1817).

Savastana odorata Scribn. Mem. Torr. Club 5: 34. (1894).

Leeds, Butte.

* Tribe VI. **AGROSTIDEAE** Kunth, Mem. Mus. Paris II:72. (1815), also Dum. l. c. 83. (1823).

ARISTIDA Linn. Sp. Pl. 82. (1753), also Gen. Pl. 35. (1754).

73. *Aristida longiseta* Steud. Syn. Pl. Gram. 420. (1855).
Medora (Bergman).

STIPA Linn. Sp. Pl. 78. (1753), also Gen. 34. (1754).

74. *Stipa viridula* Trin. Mem. Acad. St. Petersburg. (VI.) 5: 75 (1842). Gram. Suppl. 39. (1836).

Leeds, Butte.

75. *Stipa comata* Trin. et Rupr. Mem. Acad. St. Petersburg. (VI.) 5: 75 (1842), *Agrost.* 3: 75. (1842).

Leeds, Butte, Towner.

76. *Stipa spartea* Trin. Mem. Acad. St. Petersburg. (VI.) 1: 82. (1831).

Medora (Bergman).

URACHNE Trin. Fund. *Agrost.* 109. (1918).

Oryzopsis Michx. Fl. Bor. Am. I: 51. (1803). Name founded on *Oryza* and therefore not acceptable.

77. *Urachne micrantha* Trin. et Rupr. Mem. Acad. St. Petersburg. (VI.) 5: 16 (1842).

Oryzopsis micrantha Thurb. Proc. Phila. Acad. 1863, 78. (1863).
Morton Co.: Swastika (S. W. Colebank.)

78. **Urachne asperifolia** (Michx.) Trin. Unifl. 1: 174 (1824).
Oryzopsis asperifolia Michx. Fl. Bor. Am. 1: 51. (1803).
 Devil's Lake, Turtle Mountains.
MUHLENBERGIA Schreb. Gen. 44. (1789).
79. **Muhlenbergia mexicana** (Linn.) Trin. Unifl. 189. (1824).
Agrostis mexicana Linn. Mant. 1: 31. (1767).
 Benson Co.: Peninsula of Lake Ibsen?
80. **Muhlenbergia racemosa** (Michx.) B. S. P. Prel. Cat. N. Y. 67. (1788).
Agrostis racemosa Michx. Fl. Bor. Am. 1: 53. (1803).
Muhlenbergia glomerata Trin. Unifl. 191. (1824).
 Leeds, Butte, Minot, Bismarck.
81. **Muhlenbergia foliosa** Trin. Gram. Unifl. 190. (1824).
 Butte.
82. **Muhlenbergia umbrosa attenuata** Scribn. var. nov. ined.
 Butte.
- STELEPHURAS** Theophrastus 7: 10, p. 842 Stapelius edition (1644), also Adanson, Fam. des Pl. II, p. 31. (1763).
Plantinia Bubani Fl. Pyr. IV. p. 269. (1901).
Phleum Linn. not *Phleum* Theophrastus. Hist.
83. **Stelephuras pratensis** (Linn.) Lunell.
Phleum pratense Linn. Sp. Pl. 60. (1753).
 Leeds, York, Pleasant Lake.
- TOZZETTIA** Savi Mem. Soc. Nat. Sc. VIII. 477. (1798).
Alopecurus Linn. Syst. (1735). Gen. 18, (1737) not Theophrastus or prae-Linnaeans.
84. **Tozzettia geniculata** (Linn.) Lunell.
Alopecurus geniculatus Linn. Sp. Pl. 60. (1753).
 Leeds, Oberon.
85. **Tozzettia fulva** (J. E. Smith) Lunell.
Alopecurus fulvus J. E. Smith Engl Bot. 21. t. 1467. (1793).
 Leeds.
- AGRESTIS** Bubani Fl. Pyr. IV. 281. (1901).
Agrostis Linn. Syst. (1735). Gen. 19. (1737), 30. (1754), not Dioscorides 4: 30, or ancients.
86. **Agrestis alba** (Linn.)
Agrostis alba Linn. Sp. Pl. 63. (1753).
 Leeds, Jamestown.
87. **Agrestis hyemalis** (Walt.)
Cornucopiae hyemalis (Walt.) Fl. Car. 73. (1788).

Agrostis hyemalis B. S. P. Prel. Cat. N. Y. 68. (1888).

Leeds, Butte,; Kulm (Brenckle).

SPOROBOLUS R. Br. Prodr. Fl. Nov. Holl. I: 169. (1810).

88. *Sporobolus brevifolius* (Nutt.) Scribn. Mem. Torr.

Club. 5: 39. (1895).

Agrostis brevifolia Nutt. Gen. I: 44. (1818).

Leeds.

89. *Sporobolus depauperatus* Scribn. Bull. Torr. Club. 9:

103. (1882).

Leeds.

90. *Sporobolus cuspidatus* (Torr.) Wood, Bot. et Fl. 385,

(1870.)

Vilfa cuspidata Torr., Hook Fl. Bor. Am. 2: 238. (1840).

Leeds, Dunsieith.

91. *Sporobolus Richardsonis* (Trin.) Merr. in Rhodora. 46.

Vilfa Richardsonis Trin. Mem. Acad. St. Petersburg. Ser. VI.

Sc. Nat. V. 11. 103. (1840).

Leeds, Butte, Towner.

92. *Sporobolus cryptandrus* (Torr.) A. Gray. Man. 576.

(1848).

Agrostis cryptandra Torr. Ann. Lyc. N. Y. 1: 151. (1824).

Pretty Rock (Bell); Pleasant Lake.

93. *Sporobolus cryptandrus vaginatus* Lunell, Am. Midl.

Nat. Vol. II. p. 123. (1911).

Midl. Nat. Vol. II. p. 123. (1911).

Pleasant Lake.

94. *Sporobolus asperifolius* (Ness and Meyen) Thurber, S.

Wats. Bot. Cal. 2: 269 (1880).

Vilfa asperifolia N. et M., Trin. Mem. Acad. St. Petersburg. (VI.)

6: 95. (1840).

Dévil's Lake, Minnewaukan.

DEYEUXIA Clarion Beauv. Agrost. 43. pl. 9, f. 9, 10. (1812).

Calamagrostis Adans. Fam. des Pl. 2: 31. (1763), in part.

Bubani correctly objects to this name, because it is made up of *Calamus* and *Agrostis*, two names already used! Not *Calamagrostis* Trag. Hist. 677. 679. (1792), which is in one case a *Sparganium*, a *Cyperus*, and a *Juncus*!

95. *Deyeuxia montanensis* (Scribn.) Lunell.

Calamagrostis montanensis Scribn., Vasey Contr. U. S. Nat.

Herb. 3: 83. (1892).

Leeds, Pleasant Lake.

96. *Deyeuxia canadensis* (Michx.) Munro; Hook. f. Trans. Linn. Soc. 23: 345.

Agrostis canadensis Michx. Fl. Bor. Am. 1: 73. (1803).

Calamagrostis canadensis Beauv. Agrost. 159. (1812).

Pleasant Lake.

97. *Deyeuxia neglecta* (Ehrh.) Lunell.

Arundo neglecta Ehrh. Beitr. 6: 137. (1791).

Calamagrostis neglecta Gaertn. Fl. Wett. 1: 94. (1799).

Pleasant Lake.

98. *Deyeuxia hyperborea* (Lange) Lunell.

Calamagrostis hyperborea Lange, Fl. Dan. 50: t. 3. (1880).

Leeds, Rolette.

99. *Deyeuxia hyperborea stenodes* (Kearney) Lunell.

Calamagrostis hyperborea stenodes Kearney Bull. U. S. Dépt. Agric. Div. Agrost. II: 39.

Norderhof (Logan County): Brenckle.

100. *Deyeuxia hyperborea elongata* (Kearney) Lunell.

Calamagrostis hyperborea elongata Kearney, Bull. U. S. Dept. Agric. Div. Agrost. 11: 40.

Leeds, Pleasant Lake.

ATHERNOTUS Dulac, vide Bubani, Fl. Hauts Pyr. 74. (1867).

Calamovilfa Hack. True Grasses 113. (1890).

Here again comes the same objection to the permissibility of this name, it being a combination of two grass names like *Calamagrostis*.

101. *Athernotus longifolius* (Hook.) Lunell.

Calamagrostis longifolia Hook. Fl. Bor. Am. 2: 241. (1840).

Calamovilfa longifolia Hack l. c.

Leeds, Pleasant Lake.

Tribe VII. *AVENEAE* Nees. Nov. Act. Acad. Nat. Cur. XIX. Suppl. I: 154. (1823).

SPHENOPHOLIS Scribn.

102. *Sphenopholis obtusata* (Michx.) Scribn.

Eaonia obtusata (Michx.) A. Gray Man. 2: 558. (1856).

Aira obtusata Michx. Fl. Bor. Am. 1: 62. (1803).

Leeds; Kulm (Brenckle).

KOELERIA Pers. Syn. 1: 97. (1805).

103. *Koeleria cristata* (Linn.) Pers. l. c.

- Aira cristata* Linn. Sp. Pl. 63. (1753).
 Devil's Lake, Leeds, Willow City.
- TRisetum* Pers. Syn. 1: 97. (1805).
 104. *Trisetum melicoides* (Michx.) Vasey.
Aira melicoides Michx Fl. Bor. Am. 1: 62. (1803).
Graphephorum melicoideum Beauv. Agrost. 164. (1812).
 Butte.
- DESCHAMPSIA* Beauv. Agrost. 91. pl. 18. f. 3. (1812).
 105. *Deschampsia caespitosa* (Linn.) Beauv. Agrost. 160.
 pl. 18. f. 3. (1812).
Aira caespitosa Linn. Sp. Pl. 64. (1753).
 Sheyenne, Towner.
106. *Deschampsia flexuosa* (Linn.) Trin. Bull. Acad. Sci.
 St. Petersb. 1: 66. (1836).
Aira flexuosa Linn. Sp. Pl. 65. (1753).
 Leeds, Butte.
- AVENA* Vergilius Ecl. I: 2. V: 37. Georg. I: 77. I: 154. 1:
 226. Colum. II: 11, also Varro, and all pre-Linnaean and post-
 Linnaean authors. Tour. Éls. 415. (1694). I. R. H. 574. (1700).
 Linn. Syst. (1735). Gen. 15. (1737), 85. (1754).
Avenacea Scheuch. 4: 15. 22. *Bromus* Fuchs. Hist. 65. (1546).
Bromus Dioscorides 4: 140 = *Avena fatua*.
107. *Avena sativa* Tragus, De Stirpium Hist. 653. (1552).
 Linn. Sp. Pl. 79. (1753).
 Leeds, Butte.
108. *Avena fatua* Linn. Sp. Pl. 80. (1753).
 Leeds, Butte.
109. *Avena striata* Michx. Fl. Bor. Am. I: 73. (1803).
 Devil's Lake.
110. *Avena americana* Scribn. Bull. Agrost. U. S. Dept.
 Agr. 7, 183. (1897).
 Tribe VIII. **CHLORIDEAE** Kunth. Mem. Mus. Paris II:
 72. (1815).
SPARTINA Schreb. Gen. 43. (1789).
111. *Spartina Michauxiana* Hitchc. Gray. Man. VII. 142.
 (1908).
Spartina cynosuroides Am. Auth., not Roth.
 Leeds, Butte.
112. *Spartina gracilis* Trin. Mem. Acad. St. Petersb. 6: 5.
 (1840).

Leeds, Minnewaukan, Butte, York.

SPIROCHLOE Lunell, nom. nov. (from $\sigma\pi\rho\tilde{\alpha}\nu$, to twist, and $\chi\lambda\acute{o}\nu$, grass, the axis of the panicle at maturity becoming elongated and spiral).

Schedonnardus Steud. Syn. Pl. Gram. 146. (1855). The name not thought permissible, being built on *Nardus*.

113. *Spirochloe paniculata* (Nutt.) Lunell.

Lepturus paniculatus Nutt. Gen. 1: 81. (1818).

Schedonnardus paniculatus Trelease, Branner et Coville, Rep. Geol. Surv. Ark. 1888: Part 4. 236. (1891).

Dickinson (Bergman).

BOUTELOUA Lag. Var. Cienc. 2: p. 4. 134. (1818).

114. *Bouteloua gracilis* (H. B. K.) Lag. Steud. Nom. Bot. ed. 2. 1: 219. (1840).

Chondrosium gracile H. B. K. Nov. Gen. et Sp. 1: 176. pl. 58. (1816).

Bouteloua oligostachya Torr. in Gray Man. 553. (1856).

Atheropogon oligostachyum Nutt. Gen. 1: 78. (1818).

Leeds, Dunsieith, Pleasant Lake.

115. *Bouteloua curtipendula* (Michx.) Torr. in Emory Mil. Recon. 154. (1848).

Chloris curtipendula Michx. Fl. Bor. Am. 1: 59. (1803).

Butte, Minot.

BECKMANNIA Host. Gram. Austr. 3: 5, pl. 6. (1805).

116. *Beckmannia erucaeformis* (Linn.) Host. l. c.

Phalaris crucaeformis Linn. Sp. Pl. 55. (1753).

Leeds, Butte.

BULBILIS Raf. Am. Month. Mag. 4: 190. (1819).

Buchloe Engelm. Trans. St. Louis Acad. 1: 432. (1859).

117. *Bulbilis dactyloides* (Nutt.) Raf.; Kuntze. Rev. Gen. Pl. 763. (1891).

Sesleria dactyloides Nutt. Gen. 1: 65. (1818).

Logan Co. (Brenckle.)

Tribe IX. **FESTUCACEAE** Dum. Obs. Gram. Agrost. Belg. 82. (1823).

MUNROA Torr. Pac. R. R. Rept. 4: 158. (1856).

118. *Munroa squarrosa* (Nutt.) Torr. l. c.

Crypsis squarrosa Nutt. Gen. 1: 49. (1818).

Medora (Bergman).

PHRAGMITES Dioscorides 1: 14.

119. *Phragmites communis* Trin. Fund. Agrost. 134. (1820).
Harnudo phragmitis Ruellius, Comarus, Dodonaeus.
 Lake Ibsen, Dunsieith.

EROSION Lunell, nom. nov. (dedicated to Έρως, the love god).
Eragostis Beauv. Agrost. 70. pl. 14, f. 11. (1812). The name
 to be avoided, as built on another grass name.

120. *Erosion ciliare* (All.) Lunell.
Eragrostis ciliaris (All.) Link. See Hubbard, Philipp. Journ.
 Sci. Bot. 8: 159-161. (1913).
Eragrostis megastachya (Koehl.) Link, Hort. Berol. 1: 187.
 1827).

Pingree, Leeds, Dunsieith, Devil's Lake.

121. *Erosion hypnoides* (Lam.) Lunell.
Eragrostis hypnoides (Lam.) B. S. P., Prel. Cat. N. Y. 69. (1888)
Poa hypnoides Lam. Tabl. Encycl. 1: 185. (1791).
 Wahpeton (Bergman).

CATABROSA Beauv. Agrost. 97 (1812).

122. *Catabrosa aquatica* (Linn.) Beauv. Agrost. 157. (1812).
Aira aquatica Linn. Sp. Pl. 64. (1753).

Butte, Pleasant Lake.

DALUCA Bubani, Fl. Pyr. IV. p. 350. (1901).

Melica Linn. Fl. Lapp. 36. (1737), Gen. 315. (1737), not
Melica Dodonaeus, Lobelius, Caesalpinus, which is *Holcus Sorghum*
 Linn.

123. *Daluca Hallii* (Vasey) Lunell.

Melica Hallii Vasey, Bot. Gaz. 6: 296. (1881).

Festuca Hallii (Vasey) Piper. Contr. U. S. Nat. Herb. X.
 31. (1906).

Butte.

DISTICHLIS Raf. Journ. Phys. 89: 104. (1819).

124. *Distichlis spicata* (Linn.) Greene, Bull. Cal. Acad. 2:
 415. (1887).

Uniola spicata Linn. Sp. Pl. 71. (1753).

Leeds, Devil's Lake.

DACTYLIS Royen Lugd. Fl. 56. (1740). Linn. Gen. 29.
 (1742). Gron. Fl. Virg. p. 135. (1743).

125. *Dactylis glomerata* Linn. Sp. Pl. 71. (1753).

Leeds.

PANEION Lunell, nom. nov. (dedicated to Πάν, Pan, the

god of the shepherds, of the pastures and the woods, because all its species are valuable fodder grasses).

Poa was the Theophrastan and Greek name for any kind of grass, like the latin *gramen*, or for any herbaceous plant).¹ The name ought to be disregarded for the same reason as the words *planta* or *herba* are unfit as generic names!

Poa Linn. Gen. 20. (1737).

126. **Paneion aridum** (Vasey) Lunell.

Poa arida Vasey, Contr. U. S. Nat. Herb. 1: 270. (1893).
York.

127. **Paneion Buckleyanum maius** (Vasey) Lunell.

Poa Buckleyana Nash. Bull. Torr. Club. 22: 465. (1895), var. *maior* (Vasey).

Poa tenuifolia Buckley, Proc. Acad. Phila. 1862: 96. (1862).
Not A Rich. (1851), var. *maior* Vasey.

Leeds.

128. **Paneion bulbosum** (Linn.) var. **viviparum** (Koch.)
Lunell.

Poa bulbosa Linn. var. *vivipara* Koch. Fl. Syn. Germ. et Helvet. p. 802. (1837).

Dickinson (Cl. Waldron).

129. **Paneion compressum** (Linn.) Lunell.

Poa compressa Linn. Sp. Pl. 69. (1753).

Dunsieth.

130. **Paneion glaucum** (Vahl.) Lunell.

Poa glauca Vahl. Fl. Dan. pl. 964. (1790).

Dunsieth.

131. **Paneion interius** (Rydberg) Lunell.

Poa interior Rydb. Bull. Torr. Club. 32: 604. (1905).

Rolette Co.: Nansen.

132. **Paneion longiligulum** (Scribn. et Williams) Lunell.

Poa longiligula Scribn. et Williams, Circ. U. S. Dept. Agric. Div. Agrost. 9: 3. (1899).

Pleasant Lake.

133. **Paneion nemorale** (Linn.) Lunell.

Poa nemoralis Linn. Sp. Pl. 69. (1753).

Leeds, York, Pleasant Lake, Devil's Lake, Dunsieth, Turtle Mountains.

134. **Paneion pratense** (Linn.) Lunell.

¹ Cfr. "gras" in the norvegian-american brogue of to-day.

Poa pratensis Linn. Sp. Pl. 67. (1753).

Leeds, Devil's Lake.

135. *Paneion pratericolum* (Rydb. et Nash) Lunell.

Poa pratericola Rydb. et Nash, Mem. N. Y. Bot. Gard. I:

51. (1900).

Butte, Towner.

136. *Paneion Sandbergii* (Vasey) Lunell.

Poa Sandbergii Vasey, in Scribn. Bull. Torr. Bot. Club 10:

276. (1883).

Leeds.

137. *Paneion triflorum* (Gilib.) Lunell.

Poa triflora Gilib. Exercit. 531. (1782).

Poa serotina Ehrh. Beitr. 6: 83. (1791).

Poa flava Am. Authors, not Linn.

Leeds.

SCOLOCHLOA Link. Hort. Berol. 1: 136. (1827).

138. *Scolochloa festucacea* (Willd.) Link. l. c. 137.

Arundo festucacea Willd. Enum. 1: 126. (1809).

Leeds, Lake Ibsen. The sterile plant covers square miles of dried up lake bottoms in the state!

GLYCERIA R. Br. Prodr. Fl. Nov. Holl. 1: 179. (1810).

Panicularia Fabricius, Enum. Hort. Helmst. 373. (1763).

Name bad, if derived from *Panicum* (dim. *Panicula*, and then *Panicularia*; or if built on *panicula*, panicle, just as objectionable, as if *spica* or *capitulum* or *racemus* were used as material for genus names.

139. *Glyceria nervata* (Willd.) Trin. Mem. Acad. St. Petersburg. 1: 365. (1831).

Poa nervata Willd. Sp. Pl. 1: 389. (1798).

Panicularia nervata Kuntze Rev. Gen. Pl. 783. (1891).

Butte, Pleasant Lake.

140. *Glyceria nervata rigida* (Nash.) Lunell.

Panicularia nervata rigida Nash. Mem. N. Y. Bot. Gard. 1:

54. (1900).

Butte.

141. *Glyceria americana* (Torr.) Lunell.

Poa aquatica var. *americana* Torr. Fl. U. S. 1: 108. (1824).

Glyceria grandis S. Wats. in Gray Man. VI. 667. (1890).

Panicularia americana McM. Met. Minn. 81. (1892).

Leeds, Butte, Pleasant Lake.

142. *Glyceria borealis* (Nash.) Batchelder.

Panicularia borealis Nash in Bull. Torr. Bot. Club 24: 348 (1897).

Paradise (Bell); Butte (extinct).

PUCCINELLIA Parl. Fl. Ital. 1: 366. (1848).

143. *Puccinellia maritima* (Huds.) Parl. l. c. 370.

Poa maritima Huds. Fl. Angl. 35. (1762).

Glyceria maritima M., et K. Deutsch. Fl. 1: 588. (1823).

Devil's Lake.

144. *Puccinellia airoides* (Nutt.) Wats., et Coult. in A. Gray, Man. VI: 668. (1890).

Poa airoides Nutt. Gen. 1: 68. (1818).

Leeds, York, Devil's Lake.

GNOMONIA (gr. γνόμων, alluding to fescue, in the English name of the genus) Lunell, nom. nov. *Festuca*, first applied by Dodonaeus, Herb. 321. (1551) = *Bromus secalinus*.

Festucaria Heister, Syst. 45. (1737) is founded on *Festuca*, and for this reason not much of a name, and undesirable.

Festuca Linn. Syst. (1735), Gen. 15, (1737).

145. *Gnomonia octoflora* (Walt.) Lunell.

Festuca octoflora Walt. Fl. Car. 81. (1788).

Dickinson (Bergman).

146. *Gnomonia ovina* (Linn.) Lunell.

Festuca ovina Linn. Sp. Pl. 73. (1753).

Butte, Towner.

147. *Gnomonia ovina supina* (Hack.) Lunell.

Festuca ovina supina Hack.

Butte.

148. *Gnomonia elatior* (Linn.) Lunell.

Festuca elatior Linn. Sp. Pl. 75. (1753).

Wahpeton (Bell).

149. *Gnomonia nutans* (Willd.) Lunell.

Festuca nutans (Willd. Enum. I: 116. (1809).

Valley City (Bergman).

150. *Gnomonia viridula* (Vasey) Lunell.

Festuca viridula Vasey, Ill. N. A. Grasses t. 93. (1893), also Contr. U. S. Nat. Herb. 1: 279. Calif.

Dunsieth (only locality known east of Idaho).

FORASACCUS Bubani, Fl. Pyr. IV. p. 380. (1901).

Bromus Sibth., Matthiolus, Dodoneaus, Lobelius, Caesalpinus,

C. Bauhin, etc. = *Avena fatua*.

Bromus Linn. synonym to *Avena*.

Avenaria Heister, Syst. 12. (1743), founded on *Avena*.

151. **Forasaccus arvensis** (Linn.) Bubani l. c. 385.

Bromus arvensis Linn. Sp. Pl. 77, (1753).

Fargo (Bergman).

152. **Forasaccus ciliatus** (Linn.)

Bromus ciliatus Linn. Sp. Pl. 76. (1753).

Dokkens Pond; Peninsula of Lake Ibsen.

153. **Forasaccus ciliatus laeviglumis** (Scribn.) Lunell.

Bromus ciliatus laeviglumis Scribn.

Leeds.

154. **Forasaccus purgans** (Linn.) Lunell.

Bromus purgans Linn. Sp. Pl. 76. (1753).

Minot.

155. **Forasaccus breviaristatus** (Hook.) Lunell.

Bromus breviaristatus Buckl. Proc. Acad. Phila. 1862: 98. (1862)

Ceratochloa breviaristata Hook. Fl. Bor. Am. 2: 253. (1840).

Bottineau.

156. **Forasaccus latiglumis** (Hitchc.) Lunell.

Bromus latiglumis Hitchc, Rhodora VIII: 211. (1906).

Towner.

157. **Forasaccus marginatus** (Nees.) Lunell.

Bromus marginatus Nees in Steud. Syn. Pl. Gram. 322. (1824).

Devils Lake, Dunsieith.

158. **Forasaccus inermis** (Leyss.) Lunell.

Bromus inermis Leyss. Fl. Hal. 16. (1761).

Leeds.

159. **Forasaccus Pumpellianus** (Scribn.) Lunell.

Bromus Pumpellianus Scribn. in Bull Torr. Bot. Club. 15:

9. (1888).

Leeds, York.

Tribe X. **HORDEAE** Lindl. Veg. Kingd. 116. (1847).

LOLIUM Vergilius Ecl. V: 37, Georg. I: 154, also Plinius 18:

46. Linn. Syst. (1733), Gen. 16. (1737), 36. (1755).

160. **Lolium infelix** Vergilius l. c. both places.

Lolium temulentum Linn. Sp. Pl. 83. (1753).

Dickinson (C. Waldron).

ZEIA, *Zea* Dioscorides 4: 23 = *Triticum Spelta* Linn.

Agropyron J. Gaertn. Nov. Comm. Petrop. 14: Part 1. 539.
(1770).

161. *Zeia Spelta* (Linn.) Lunell.

Triticum Spelta Linn. Sp. Pl. 423. (1753).

Occasionally escaped from cultivation. Butte.

162. *Zeia vulgaris aestiva* (Linn.) Lunell.

Triticum vulgare aestivum Linn.

An occasional escape. Butte.

163. *Zeia biflora* (Brign.) Lunell.

Agropyron biflorum (Brign.) Roem. et Schult Syst. II. 760.
(1817).

Towner.

164. *Zeia canina* (Linn.) Lunell.

Agropyron caninum (Linn.) R. S. Syst. 1. c. 756.

Triticum caninum Linn. Sp. Pl. 86. (1753).

Towner, Pleasant Lake, Dunsieith.

165. *Zeia cristata* (J. Gaertn.) Lunell.

Agropyron cristatum J. Gaertn. 1. c. 540.

Dickinson (C. Waldron).

166. *Zeia dasystachya* (Hook.) Lunell.

Agropyron dasystachyum (Hook.) Vasey, Spec. Rept. U. S.
Dept. Agric. 63: 45. (1883).

Dickinson (C. Waldron).

167. *Zeia glauca* (Desf.) Lunell.

Agropyron glaucum (Desf.) R. et S. Syst. 2: 752. (1817).

Triticum glaucum Desf. Scribn. Mem. Torr. Bot. Club 5:

57. (1894).

Leeds.

168. *Zeia mollis* (Scribn. et Sm.) Lunell.

Agropyron molle (S. et S.) Rydb. Mem. N. Y. Bot. Gard. Vol.
I: 65. (1900).

Medora (Bergman).

169. *Zeia occidentalis* (Scribn.) Lunell.

Agropyron occidentale Scribn. U. S. Dept. Agric. Div. Agrost.
Cir. 27: 9. (1900).

Towner.

170. *Zeia pseudorepens* (Scribn. et Sm.) Lunell.

Agropyron pseudorepens S. et S. U. S. Dept. Agric. Div. Agrost.
Bull. 4: 34. (1897).

Devil's Lake.

171. *Zeia repens* (Linn.) Lunell.

Agropyron repens (Linn.) Beauv. Agrost. 146. (1812).

Triticum repens Linn. Sp. Pl. 86. (1753).

Leeds, Pleasant Lake.

172. *Zeia Richardsonii* (Schrader.) Lunell.

Agropyron Richardsonii Schrad. Linnaea XII: 467. (1838).

Leeds, Butte, Towner.

173. *Zeia riparia* (Scribn. Sm.) Lunell.

Agropyron riparium S. S. Bull. U. S. Dept. Agric. Div. Agrost.

4: 35. (1897).

Dunsieth.

174. *Zeia Smithii* (Rydb.) Lunell.

Agropyron Smithii Rydb. Mem. N. Y. Bot. Gard. Vol. 1:

61 and 64. (1900).

Leeds, Dunsieth.

175. *Zeia spicata* (Pursh) Lunell.

Agropyron spicatum (Pursh) Rydb. Mem. N. Y. Bot. Gard.

I: 61. (1900).

Medora (Bergman).

176. *Zeia tenera* (Vasey) Lunell.

Agropyron tenerum Vasey, Bot. Gaz. 10: 258. (1885).

Leeds, Butte, Devils Lake, Towner; Kulm (Brenckle).

SECALE.

177. *Secale cereale* Linn.

Subspontaneous on railroad banks. Towner, Pleasant Lake.

HORDEUM Vergilius Ecl. V: 36. Georg. I: 317, Cato 35,

Plinius 18: 7, Colum. II: 9. *Krithe leuce* Homeros, Odys. 3, 41,

Iliad I: 196, Athen, Deipuf I: 61. *Krithe* Theophr. Hist. 2: 3.

Bosmoron Strabo? (this latter perhaps *Mais vulgaris*!), *Krithe*

Achilleis, Hippokrates Morb. 3: 496, also *Hordeum* of all older

and later writers Tour. Linn. before and after: Linn. Syst. (1735),

Gen. 16. (1757), 37 (1755); Tour. Éls. 414. (1694) I. R. H. 513.

(1700).

178. *Hordeum jubatum* Linn. Sp. Pl. 85. (1753).

Leeds.

179. *Hordeum vulgare* Linn. Sp. Pl. 85. (1753).

Subspontaneous. Butte.

TERRELLIA (latinizing from its English name, Terrell-grass) Lunell, nom. nov.

Elymus is according to Adanson, Fam. 2. 606. (1763)=

Litospelos which name was applied by Diosc. to *Triticum sylvestre* and *Aegilops*. Acc. to Caesalpinus *Elymus* refers to *Panicum vulgare* which was called *Elymum* and *Meline* by Theophr. *Elymus* Linn. Sp. Pl. 83. (1753). Name very doubtful.

180. **Terrellia striata** (Willd.) Lunell.

Elymus striatus Willd. Sp. Pl. 1: 470, (1797).

Devil's Lake.

181. **Terrellia virginica** (Linn.) Lunell.

Elymus virginicus Linn. Sp. Pl. 84. (1753).

Peninsula of Lake Ibsen.

182. **Terrellia virginica submutica** (Hook.) Lunell.

Elymus virginicus submuticus Hook. Fl. Bor. Am. 2: 255. (1840).

Minot, Towner.

183. **Terrellia canadensis** (Linn.) Lunell.

Elymus canadensis Linn. Sp. Pl. 83. (1753).

Devil's Lake, Turtle Mountains, Leeds, Towner, Pleasant Lake; Kulm (Brenckle). Extremely variable.

184. **Terrellia canadensis glaucifolia** (Willd.) Lunell.

Elymus canadensis glaucifolius (Willd.) Torr. Fl. U. S. I:

137. (1824).

Elymus glaucifolius Willd. Enum. 1: 131. (1809).

Fargo (Bergman).

185. **Terrellia glauca** (Buckl.) Lunell.

Elymus glaucus Buckley, Proc. Acad. Phila. 1862: 99. (1862).

Butte, Turtle Mountains.

186. **Terrellia Macounii** (Vasey) Lunell.

Elymus Macounii Vasey, Bull. Torr. Club 13: 119. (1886).

Towner, Peninsula of Lake Ibsen.

187. **Terrellia diversiglumis** (Scribn. et Ball) Lunell.

Elymus diversiglumis Scribn. Ball. et Bull. U. S. Dept. Agr.

Agrost. 24. 48. f. 22. (1901).

Walhalla (Bergman).

GYMNOSTICHUM Schreb. Besch. Gras. 2. 127. pl. 47. (1810).

Asprella Willd. Enum. 132. (1809). Not Schreb. (1789).

Hystrix Moench. Mteh. 294. (1794). This is the Greek word for hedgehog, and is an improper name for a plant!

188. **Gymnostichum patulum** (Moench.) Lunell.

Hystrix patula Moench l. c. Devil's Lake.

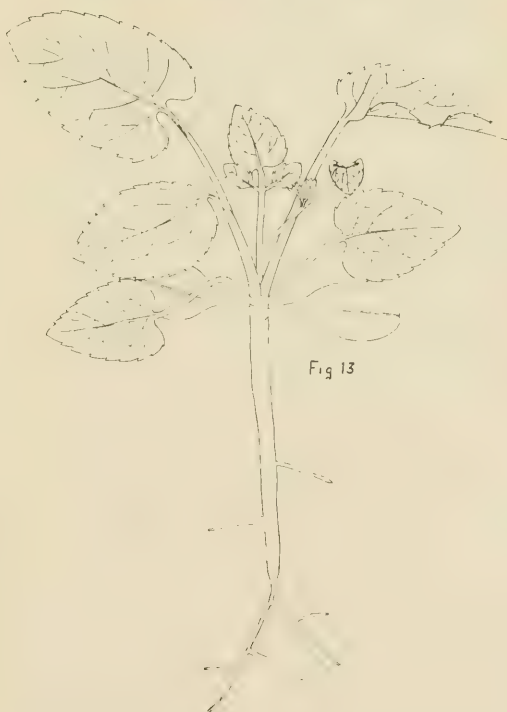
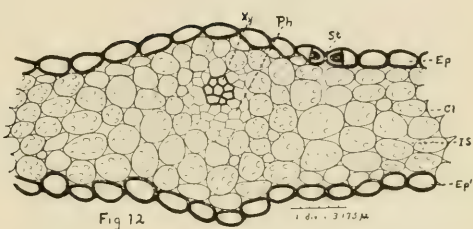
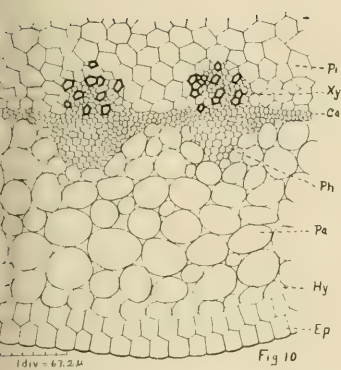
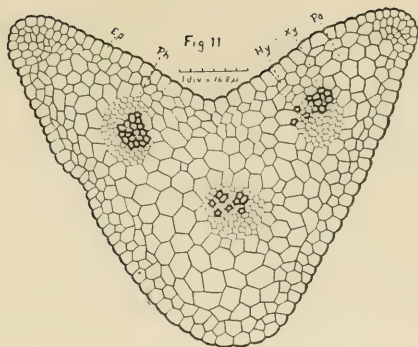
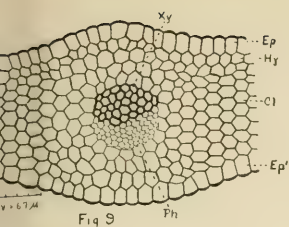


PLATE XII. LYNCH ON SAMBUCUS PUBENS VAR. XANTHOCARPA.

THE AMERICAN MIDLAND NATURALIST

Devoted to Natural History, Primarily
that of the Prairie States

Published by the University of Notre Dame,
Notre Dame, Indiana

J. A. NIEUWLAND, C. S. C., Ph. D., Sc. D., Editor

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Edward Lee Greene

BORN, HOPKINTON, R. I., AUGUST 20, 1843
DIED, WASHINGTON, D. C., NOVEMBER 10, 1915

IN MEMORIAM.

Botanists and scientific men generally in this country and abroad will realize that in the passing away of Dr. Edward Lee Greene, the world has lost one of its ablest scholars and a modest type of perfect gentlemen. His work for thorough, exact, remarkable insight into questions trying and difficult was even more respectfully acknowledged and praised in the old world than at home in America. He was one of those gentle unselfish kindly men that allow no obstacle to stand in the way towards the attainment of truth in every line of endeavor, scientific or religious. Concerning the assistance which in a hidden way he gave to the needy with the modest means at his hand in pecuniary matters, we have heard from all sides, and that too with out any hope or expectation of return. His kindness in spending his precious time helping others in things scientific has been felt by all who have had the pleasure of being associated with him but a short time. His particular form of charity was assisting others too learn, or educate themselves.

Scientific research was so thoroughly a passion with him that no mere matters of earthly gain or temporal expedience could tempt him from seeking always the higher things. In fact, this caption, the motto of his bookmark, has been the guiding ideal of his whole long useful and unselfish career: "*Altiora petivimus*," "We have striven for the higher things." None but the highest and most difficult problems could tempt his attention.

When the botany of the Eastern United States began to languish after Asa Gray, Engelman and Torrey had passed away, Dr. Greene fresh from fields of the West, showed the students of the Atlantic Flora that many a new and unknown species still blushed unseen at their very feet. When he began to publish new plants from a region hitherto considered to be well known, botanists were at first incredulous, but finally felt that they had been lulled to inactivity. When the better part of his life had been spent in another field of work, we owe it to him to have aroused us in the East to zeal and activity in studying the unknown wonders of our botanic region. Not a few journals of natural history came into being or were encouraged to higher and better work by his coming among us.

Dr. Greene was born in Hopkinton, R. I., Aug. 20, 1843.

When he was still a boy his parents moved West and settled along the Sangamon River in Illinois. He served in the Civil War as private and on the campaign, collected plants and determined them in odd moments from a copy of Wood's botany which he carried in his knapsack. After the war he received the degree Ph. B. at Albion, Wisconsin in 1866. Thenceforth a longing to botanize in other fields drew him to Colorado in 1870. Here he became an Episcopal minister, and he asked for charges in country places the better to devote his spare time to his favorite science. He botanized through Wyoming, New Mexico, Arizona, and California. He was instructor, or professor, in the University of California from 1885 to 1895, when he came East to take the chair of Botany in the Catholic University of America at Washington, D. C. In 1894 he received the doctorate from the University of Notre Dame. In May, 1904, he left the Catholic University and became honorary associate in Botany in the Smithsonian Institute, where he had been occupied in research in systematic and historical botany until in the fall of 1914 he arranged to come to Notre Dame University to take charge of the graduate course in botany. His numerous collections and library were left to the University. Dr. Greene died after a rather prolonged wasting and painful stomach trouble at Providence Hospital, Washington, D. C., on Nov. 10, 1915. He had gone to Washington to meet again his old friends and associates and finish the remaining chapters of his second volume of "Landmarks."

Dr. Greene will be remembered by all who knew him long or met him but casually as a type of gentlemanly kindness and modesty that betokens deep learning. Little, however, would the ordinary observer suspect his profound erudition except by long association. Kind and gentle with all he could be unrelenting in attacking sham or presumptuous ignorance when he could use all the power of art and elegant expression in sustaining what he considered truth. There are some who were not in sympathy with his ideas of plant divisions, but the botanists with keen sense of analysis and deep perception of differences, in contradistinction to the dilettante always respected his views. There are those who did not share his opinions on priority of nomenclature, but none that know the intricacies of these questions will hesitate to admire or fear his wonderful erudition. As a historical botanist he ranks alone in America.

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NOVEMBER, 1915.

NO. 6.

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—III.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—III.

With Notes by J. Lunell.

Family 14. **CYPERACEAE** J. St. Hilaire Expos. Fam. I: 62. (1805).

CYPERUS Hom. Odys. XXI: 391. Hippoc. vie acut. 409. Theophr. Hort. IV: 11., also *Schoenus* of same. Diosc. I: 4, Theoc. loc. comm. *Zerna* Pseud. Democ. in Geopon XII: 6. *Juncus Cyperus dictus* Plinius XXI: 79 = *Cyperus rotundus* Linn. and almost all other writers. *Cyperus* Linn. Sp. Pl. 44. (1753).

189. *Cyperus Schweinitzii* Torr. Ann. Lyc. N. Y. 3: 276 (1836) Pleasant Lake; Denbigh (Bergman).

190. *Cyperus acuminatus* Torr. et Hook. Ann. Lyc. N. Y. 3: 435. (1836).

Leeds (extinct); Fargo (O. A. Stevens).

191. *Cyperus erythrorhizos* Muhl. Gram. 20. (1817). Jamestown.

ELEOCHARIS R. Br. Prod. Fl. Nov. Holl. I: 224. (1810).

192. *Eleocharis quadrangulata* (Michx.) R. et S. Syst. 2: 155. (1817).

Scirpus quadrangulatus Michx. Fl. Bor. Am. I: 30. (1803).

Eleocharis mutata Britton, not R. et S.

Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.

193. *Eleocharis olivacea* Torr. Ann. Lyc. N. Y. 3: 300. (1836):

Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.

194. *Eleocharis ovata* (Roth.) R. et S. Syst. 2: 152. (1817).
Scirpus ovatus Roth. Catal. Bot. I: 5. (1797).
Eleocharis monticola leviseta Fernald.
 Leeds, Butte.
195. *Eleocharis palustris* (Linn.) R. et S. Syst. 2: 151 (1817).
Scirpus palustris Linn. Sp. Pl. 47. (1753).
 Leeds, Butte.
196. *Eleocharis palustris* var. *vigens* Bailey; Britton, Journ. N. Y. Micros. Soc. 5: 104. (1889).
 Leeds, Oberon.
197. *Eleocharis glaucescens* Willd. Enum. 76. (1809).
 Leeds, Butte.
198. *Eleocharis acicularis* (Linn.) R. et S. Syst. 2: 154. (1817).
Scirpus acicularis Linn. Sp. Pl. 48. (1753).
 Leeds, Pleasant Lake.
199. *Eleocharis Wolfii* A. Gray, Britton Journ. N. Y. Micros. Soc. 5: 105. (1889).
Scirpus Wolfii A. Gray, Proc. Am. Acad. 10: 77. (1874).
 Fargo (O. A. Stevens).
200. *Eleocharis acuminata* (Muhl.) Nees. Linnaea 9: 294. (1835).
Scirpus acuminatus Muhl. Gram. 27. (1817).
Eleocharis compressa Sulliv. Am. Journ. Sci. 42: 50. (1842).
 Leeds, Pleasant Lake.
SCIRPUS Tragus, Stirp. Com. p. 684. (1552).
Scirpus Tour. Élem. Bor. 420. (1694).
Scirpus Linn. Sp. Pl. 47. (1753).
201. *Scirpus subterminalis* Torr. Fl. U. S. I: 47. (1824).
 Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.
202. *Scirpus americanus* Pers. Syn. I: 68. (1805).
Scirpus pungens Vahl. Enum. 2: 255. (1806).
 Leeds.
203. *Scirpus americanus longispicatus* Britton, Trans. N. Y. Acad. Sci. II: 78. (1892).
 Shores of Devils Lake.
204. *Scirpus solispicatus* Lunell, sp. nov.
 Spicula assidue solitaria, parva. Alioqui *S. americano* consimilis.
 Spikelet constantly solitary, small. Otherwise as *S. americanus*.
 Butte.

205. *Scirpus validus* Vahl. Enum. 2: 268. (1806).

Leeds, Turtle Mountains.

206. *Scirpus occidentalis* (Wats.) Chase, Rhodora, vol. 6, p. 68. (1904).

Leeds.

207. *Scirpus brittonianus* Piper. Contr. U. S. Nat. Herb. 11: 157. (1906).

Scirpus campestris

Butte, Dunsieith.

208. *Scirpus fluviatilis* (Torr.) A. Gray. Man. 527. (1848).

Scirpus maritimus var. *fluviatilis* Torr. Ann. Lyc. N. Y. 3:

324. (1836). Leeds.

209. *Scirpus rubrotinctus* Fernald, Rhodora (1900). 20.

Pleasant Lake.

210. *Scirpus atrovirens* Muhl. Gram. 43. (1817).

Butte, Dunsieith.

ERIOPHORUM Linn. Syst. (1735), Gen. 22. (1737), Sp. Pl. 52. (1753).

Linagrostis Tour. I. R. H. App. 664 (1708), also *Linagrostis* Tabernaemont. Hort. 559. (1613). *Plumaria* Heister. Syst. 12. (1748)! Gramen *Eriophorum* Dodonaeus. 'Tabernaemontanus' name is the oldest, but Bubani does not like it, because of derivation, and the writer takes the stand with him.

211. *Eriophorum angustifolium maius* Schultz.

Butte, Towner.

RYNCHOSPORA Vahl. Enum. 2: 229. (1806).

Holoschoenus Theophr. appears to be *Schoenus Mariscus* Linn. and of the Greeks = *Juncus acutus*. *Schoenus leia* Diosc. = *Scirpus Holoschoenus* L. *Schoenus Enosmus* Diosc. = *Andropogon schoenanthus*. *Schoenus* of greeks is therefore rather undefinable and may be held as equivalent of *Juncus effusus* L. or *Scirpus lacustris* L.

212. *Rynchospora capillacea* Torr. Comp. 41. (1826); A. Gray, Ann. Lyc. N. Y. III: 214. (1835), Man. 533; Britt. Ill. Fl. I: 278.

Schoenus setaceus Muhl. Gram. 6: (1817).

Butte.

CAREX Virgilius Georg. III. 231. Linn. Sp. Pl. 972. (1753). *Xiphion* of greeks (?). *Thryon* Homer. Il. 381 (?). *Carectum* Vitruvius.

ANALYTICAL KEY.*

Achenes lenticular; stigmas two.

Lateral spikes short, sessile; staminate flowers at base or apex of spikes, or plants at times with heads dioecious or nearly so.

Rootstocks long, creeping, the culms 1—few together.....I

Culm cespitose, the rootstocks at most short creeping

Staminate flowers at top of spikes.....II

Staminate flowers at bottom of spikes.....III

Lateral spikes elongated, slender, peduncled, the terminal normally staminate.....IV

Achenes triangular; stigmas three

Perigynia pubescent.....V

Perigynia glabrous or tuberculate-hispid.....VI

I.

Spikes 10 or less, distinct; sheaths hyaline opposite blades.

Heads not dioecious; styles short; perigynia short-beaked.

Leaf blades narrowly involute; rootstocks very slender, light brown.....1. *C. stenophylla*

Leaf blades 1.5–4 mm. wide, flat above; rootstocks stout, brownish black.....2. *C. camporum*

Heads dioecious; styles long; perigynia long-beaked.....3. *C. Douglasii*

Spikes very numerous, the upper closely aggregated; sheaths green striate opposite blades.....4. *C. Sartwellii*

II.

Spikes not very numerous, in a simple head.

Perigynia deep green at maturity, the spikes all separate.....5. *C. rosea radiata*

Perigynia yellowish, brownish or reddish at maturity; the upper spikes aggregated.

Perigynia not nerved on inner face and not prominently corky thickened at base.

Perigynia spreading at maturity, reddish tinged, 2.5 mm. wide.

6. *C. grvida*

Perigynia appressed at maturity, not reddish tinged, 1.25 mm. wide.....7. *C. Hookeriana*

Perigynia strongly nerved on inner face, corky thickened at base.....8. *C. stipata*

Spikes very numerous in a compound head.....9. *C. vulpinoidea*

III.

Perigynia thin or wing margined.

Bracts leaf-like, many times exceeding head.

Perigynia subulate, the beak 2–3 times length of body

10. *C. synchnocephala*.

* Shortly before this paper went to the printer, Mr. K. K. Mackenzie revised the species names and wrote this key.

Perigynia ovate, the beak half length of body.....11. *C. athrostachya*.
Bracts not leaf-like, shorter than head.

Scales narrower and shorter than perigynia: the perigynia therefore conspicuous in head.

Perigynia lanceolate, widely spreading; sterile shoots with numerous widely spreading leaves.....12. *C. cristatella*.

Perigynia ovate, not widely spreading; sterile shoots with few erect leaves.

Perigynia less than 4 mm. long.

Perigynia brownish; spikes closely aggregated, rounded at base.....13. *C. Bebbii*.

Perigynia green; spikes widely separated, the upper clavate at base.....14. *C. tenera*.

Perigynia more than 4 mm. long.....15. *C. brevior*.

Scales about as wide and as long as perigynia: the perigynia therefore not conspicuous in head.

Heads stiff; spikes approximate.....16. *C. xerantica*.

Heads slender; spikes widely separate.....17. *C. praticola*.

Perigynia at most sharp-edged, thick.

Perigynia widely spreading, less than 3 mm. long.....18. *C. interior*.

Perigynia appressed, 5 mm. long....19. *C. Deweyana*.

IV.

Pistillate spikes very many flowered; perigynia green or straw-colored.

Lower leaves of fertile culms with long blades; perigynia not papillose; culms smooth.....20. *C. aquatilis substricta*.

Lower leaves of fertile culms with much reduced blades or bladeless; perigynia minutely papillose; culms rough.....21. *C. Emoryi*.

Pistillate spikes few-flowered; perigynia golden yellow at maturity.

22. *C. aurea*.

V.

Spikes solitary.

Spikes androgynous; scales with shining white margins; leaf blades acicular.....23. *C. filifolia*.

Spikes dioecious; scales with dull white margins; leaf blades flat.....24. *C. scirpiformis*.

Spikes several.

Pistillate spikes suborbicular, few-flowered; perigynia long-tapering at base.

Mature perigynia 2mm. wide or more, the body circular in cross-section.....25. *C. heliophila*.

Mature perigynia 1.5 mm. wide, the body round—triangular in cross-section.....26. *C. pennsylvanica*.

Pistillate spikes oblong, many-flowered perigynia rounded at base.....27. *C. lanuginosa*.

VI.

Perigynia with beak entire or obliquely cut at orifice.

Braets with long closed sheaths.

Perigynia with minute beak.

Rootstocks slender, long-creeping; scales purplish.

Scales purplish tinged; perigynia obtusely triangular 28. *C. tetanica*.

Scales not purplish tinged; perigynia circular in cross-section.

29. *C. Crawei*.

Rootstocks densely caespitose; scales not purplish tinged.

30. *C. Shriveri*.

Perigynia long beaked.

Perigynia tuberculate-hispid; culms purple at base, not

fibrillose; spikes alternate flowered. . . 31. *C. assiniboinensis*.

Perigynia smooth; culms brown at base, strongly fibrillose;

spikes densely flowered. 32. *C. Sprengelii*.

Braets sheathless.

Leaves pubescent; perigynia depressed at apex. 33. *C. abbreviata*.

Leaves glabrous; perigynia not depressed at apex. . . . 34. *C. Parryana*.

Perigynia with bidentate beak.

Pistillate spikes 1 cm. long. 35. *C. viridula*.

Pistillate spikes 2.5-10 cm. long.

Perigynia with thick walls, the nerves thick; leaf-sheaths breaking and conspicuously filamentose.

Leaf-sheaths glabrous; perigynia teeth less than 2 mm. long

36. *C. laeviconica*

Leaf-sheaths soft hairy; perigynia teeth 2.5 mm. long or more

37. *C. atherodes*.

Perigynia with thin walls, the nerves slender; leaf-sheaths not filamentose.

Perigynia finely nerved; scales rough awned; spikes drooping.

38. *C. hystericina*.

Perigynia coarsely nerved; scales (except lower) not rough awned; spikes erect.

Perigynia not retrorse; spikes narrowly cylindric. . 39. *C. rostrata*.

Lower perigynia retrorse; spikes oblong. 40. *C. retrorsa*.

213. *Carex stenophylla* Wahl. Kongl. Vet. Akad. Nya Handl

(II.) 24: 142. (1803).

Leeds, Pleasant Lake.

214. *Carex camporum* Mackenzie, Bull. Torr. Bot. Club

37: 244. (1910).

Leeds, Peninsula of Lake Ibsen, Thorne; Dickey Co (Brenckle).

215. *Carex Douglasii* Boott; Hook. Fl. Bor. Am. 2: 213 pl. 214. (1840).

Leeds, Pleasant Lake; Dickinson (Cl. Waldron).

216. *Carex Sartwellii* Dewey, Am. Journ. Sci. 43: 90. (1842).

Leeds.

217. *Carex rosea radiata* Dewey, Am. Journ. Sci. 10: 276. (1826).
Pleasant Lake, Towner.
218. *Carex gravida* Bailey, Mem. Torr. Club I: 5. (1889).
Devils Lake, Peninsula of Lake Ibsen.
219. *Carex Hookeriana* Dewey, Am. Journ. Sci. 29: 248. (1836).
Butte, Pleasant Lake, Thorne.
220. *Carex stipata* Muhl. Willd. Sp. Pl. 4: 233. (1805).
Pleasant Lake.
221. *Carex vulpinoidea* Michx. Fl. Bor. Am. 2: 169. (1803)
Leeds, Oberon; Kulm (Brenckle).
222. *Carex sychnocephala* Carey, Am. Journ. Sci. (II): 4: 24. (1847).
Leeds (extinct), the dry bottom of Lake Ibsen.
223. *Carex athrostachya* Olney, Proc. Am. Acad. 8: 393 (1868).
Peninsula of Lake Ibsen (only locality known east of the Rocky Mountains).
224. *Carex cristatella* Britton, Ill. Fl. U. S. and Canada. Vol. I. p. 357. (1896).
Wahpeton (Bergman).
225. *Carex Bebbii* Olney; Bailey, Bot. Gaz. 10: 379. (1885).
Leeds.
226. *Carex tenera* Dewey, Am. Journ. Sci. 8: 97. f. 9. (1824).
Leeds, Peninsula of Lake Ibsen, Butte, Towner.
227. *Carex brevior* (Dewey) Mackenzie, in ed.
Carex straminea var. *brevior* Dewey, Am. Journ. Sci. II: 158. (1826).
Leeds, Butte, Towner, Minot; Kulm (Brenckle).
228. *Carex xerantica* Bailey, Coult. Bot. Gaz. 17: 151. (1892).
Butte.
229. *Carex praticola* Rydb. Mem. N. Y. Bot. Gard. I: 84. (1900).
Leeds, Peninsula of Lake Ibsen.
230. *Carex interior* Bailey, Bull. Torr. Bot. Club, 20: 426. (1893).
Butte, Sheyenne, Towner.
231. *Carex Deweyana* Schwein. Ann. Lyc. N. Y. I: 65. (1824).
Pleasant Lake, Turtle Mountains; Fargo (O. A. Stevens).

232. *Carex aquatilis substricta* Kükenthal, Pflanzenreich IV. 20: 309. (1909).
 Sheyenne.
233. *Carex Emoryi* Dewey, Bot. Mex. Bound. 330. (1858).
 Pleasant Lake, Towner, Minot.
234. *Carex aurea* Nutt. Gen. 2: 205 (1818).
 Devils Lake; Kulm (Brenckle); Dickinson (Cl. Waldron).
235. *Carex filifolia* Nutt. Gen. 2: 204. (1818).
 Butte, Towner.
236. *Carex scirpiformis* Mackenzie, Bull. Torr. Bot. Club 35: 270. (1908).
 Between Rolette and Thorne (extinct).
237. *Carex heliophila* Mackenzie, Torrey, Vol. 13. No. 1. (1913).
 Leeds, Butte, Minot; Kulm (Brenckle).
238. *Carex pennsylvanica* Lam. Encycl. 3: 388. (1789).
 In woods: Devils Lake and Turtle Mountains.
239. *Carex lanuginosa* Michx. Fl. Bor. Am. 2: 175. (1803).
 Leeds, Butte, Willow City, Towner.
240. *Carex tetanica* Schkuhr. Riedgr. Nachtr. 68, figs. 100 and 207. (1806).
 Leeds, Thorne, Sheyenne.
241. *Carex Crawei* Dewey, Am. Journ. Sci. (II.) 2: 246. (1846).
 Towner.
242. *Carex Shriveri* Britton, Manual 208. (1901).
 Butte.
243. *Carex assiniboinensis* W. Boott, Coult. Bot. Gaz. 9: 91. (1884).
 Peninsula of Lake Ibsen, Towner.
244. *Carex Sprengelii* Dewey, Spreng. Syst. 3: 827. (1826).
 Peninsula of Lake Ibsen, Devils Lake, Pleasant Lake, Dunsieith.
245. *Carex abbreviata* Prescott; Boott, Trans. Linn. Soc. 20: 141. (1846).
 Butte.
246. *Carex Parryana* Dewey, Am. Journ. Sci. 27: 239. (1835).
 Leeds (extinct), Towner.
247. *Carex viridula* Michx. Fl. Bor. Am. 2: 170. (1803).
 Sheyenne, Towner.
148. *Carex laeviconica* Dewey, Am. Journ. Sci. 24: 47, (1857).

Leeds, Towner, Minot; Mandan (Bergman).

249. *Carex atherodes* Spreng. Syst. 3: 828. (1826).

Leeds.

250. *Carex hystricina* Muhl., Willd. Sp. Pl. 4: 282. (1805).

Pleasant Lake, Towner.

251. *Carex rostrata* Stokes, With. Arrang. Brit. Pl. (2 ed.) 2: 1059. (1787).

252. *Carex rostrata* Stokes, var. *utriculata* (Boott.) Bailey, Proc. Am. Acad. 22: 67. (1886).

Leeds, Sheyenne, Towner.

253. *Carex retrorsa* Schwein, Ann. Lyc. N. Y. I: 71. (1824).

Along Oak Creek at Bottineau; Renville Co.: Tolley (O. A. Stevens).

Order 10. LEMNALES.

Family 15. **LEMNADEAE** S. F. Gray, Nat. Arr. Br. Pl. II, p. 729. (1821).

HYDROPHACE Haller, Helv. 3: 68. (1768).

Lemna Dalechamps (1580), Linn. Syst. (1735), Gen. 325. (1737) and 417. (1754), Sp. Pl. 970. (1753), not *Lemna* or *Lemna* Theophr. = *Marsilea vulgaris* Linn.

254. *Hydrophace trisulca* (Linn.) Bubani, Fl. Pyr. IV, p. 23. (1901).

Lemna trisulca Linn. Sp. Pl. 970 (1753).

Leeds, Butte.

255. *Hydrophace perpusilla* (Torr.) Lunell.

Lemna perpusilla Torr. Fl. N. Y. 2: 245. (1843).

Butte; Fargo (L. R. Waldron and F. F. Manns).

Order 11. AROIDEAE.

Jussieu Gen. Pl. 23. (1789). Bartling, Ord. Nat. Pl. 25. (1830).

Family 16. **ARACEAE** Necker, Act. Acad. Theod. Palate 2: 462. (1770).

ARISAEMA Martius, Flora 14: 459. (1831).

Arum Linn. Syst. (1735), Gen. Pl. 277. (1737), 431. (1754), Sp. Pl. 964. (1753), in part.

256. *Arisaema triphyllum* (Linn.) Torr. Fl. N. Y. 2: 239. (1843).

Arum triphyllum Linn. Sp. Pl. 965. (1753). Fargo (Bergman).

Order 12. XYRIDALES.

Britton, Man. 2nd ed. p. 234. (1905).

Family 17. **COMMELYNEAE** R. Brown (1810).

TRADESCANTIA Linn. Syst. (1755); Gen. Pl. 98. (1737), 37. (1742), 38. (1754); Hort. Cliff. 126. (1737); Sp. Pl. 288. (1753); Van. Royen. Lugd. 37. (1740).

257. *Tradescantia ramifera* Lunell, Am. Midl. Nat. Vol. II: 124, (1911).

Sand Hills (McHenry Co.); Pleasant Lake.

258. *Tradescantia occidentalis* Britton, Rydb. Mem. N. Y. Bot. Gard. I: 87. (1900).

Fargo (Cl. Waldron).

Family 18. **PONTEDEREAE** H. B. K. Nov. Gen. et Sp. I: 265. (1815).

HETERANTHERA R. et P. Fl. Peruv. et Chil. Pr. 9. (1794).

259. *Heteranthera dubia* (Jacq.) McM., Met. Minn. p. 138. (1892).

Jamestown; Wahpeton (Bergman).

Order 13. **LILIALES.**

Britton, Man. 2nd ed. p. 244. (1905), in part.

Family 19. **JUNCOIDEAE** Gerard, Fl. Gall. Pr. p. 138. (1761).

JUNCUS Plinius, Hist. Nat. and all prae-Linnaean writers. *Juncus* Tour. Éls. 212. (1694); I. R. H. 246. (1700); Linn. Syst. (1735), Gen. Pl. 104. (1737), 150. (1742), 152. (1754), Sp. Pl. 325. (1753).

260. *Juncus balticus* Willd. Berl. Mag. 3: 298. (1809).

Leeds.

261. *Juncus bufonius* Linn. Sp. Pl. 398. (1753).

Leeds, Jamestown.

262. *Juncus Vaseyi* Engelm. Trans. St. Louis Acad. 2: 448. (1866).

Butte.

263. *Juncus longistylis* Torr. Bot. Mex. Bound. 223. (1859).

Leeds, Butte, Pleasant Lake.

264. *Juncus nodosus* Linn. Sp. Pl. Ed. 2, 466. (1762).

Leeds, Butte, Towner.

265. *Juncus nodosus* var. *genuinus* Engelm.

Benson Co., acc. to specimen deposited in the Gray Herbarium by the writer in 1906.

266. *Juncus nodosus* var. *proliferus* Lunell. var. nov.

In locos florum folia substituta sunt. The flowers are replaced by tufts of leaves. In a cold bog among the species. Butte.

267. *Juncus Torreyi* Coville, Mem. Torr. Bot. Club, 22: 303. (1895).

Leeds, Butte.

268. *Juncus Torreyi* var. *proliferus* Lunell. var. nov.

In locos florum folia substituta sunt. The flowers are replaced by tufts of leaves. In a swamp among the species. Butte.

269. *Juncus brachycephalus* (Engelm.) Buchenau in Engler, Bot. Jahrb. 12: 268. (1890).

Juncus canadensis var. *brachycephalus* Engelm. Trans. St Louis Acad. 2: 474. (1868).

Towner, Fort Totten.

270. *Juncus Dudleyi* Wiegand, Bull. Torr. Bot. Club, 27: 524. (1900). *J. tenuis* Coult. in part, not Willd.

Leeds, Butte, Towner, St. John.

Family 20. **MELANTHACEAE** R. Br. Prodr. I: 272. (1810). *ANTICLEA* Kunth.

Zygadenus Michx. Fl. Bor. Am. I: 213. (1803), in part.

271. *Anticlea elegans* (Pursh) Rydb. Fl. of Colo. 76. (1906)

Zygadenus elegans Pursh. Fl. Am. Sept. 241. (1814).

Leeds, Butte, Thorne, Barton, Minot.

OAKESIA Wats.

272. *Oakesia sessilifolia* (Linn.) Wats. Proc. Am. Acad. 14: 269. (1879).

Uvularia sessilifolia Linn. Sp. Pl. 305. (1753).

Fargo (Bergman).

Family 21. **ALLIACEAE** Bartsch, also Dum. An. Fam. 61. (1829). *Cepaeae* Salisb. Gen. Pl. Lir. 88. (1866).

Allieae Kunth. Enum. Pl. 4, p. 379. (1843).

CEPA Virgilius Mov. 84. Columella. *Cepulla* Pall. Fil. ex. Oct. 11. *Krommuon* Theophr. VII: 14, Diosc. II: 181. *Cepa vulgaris* Bauhin Pin. II: 1, and of nearly all other writers. Onion of the ancients.

273. *Cepa rubens* Virgilius l. c.

Allium Cepa Linn. Sp. Pl. 294. (1753).

Probably escaped. Railroad ditch, Thorne.

ALLIUM (garlic of the ancients) Plinius, Tournef. Éls. Bot. p. 304. (1694). I. R. H. 383. (1700). Linn. Syst. (1735). Gen. 103. (1737), 141. (1742), 143. (1754). Royen, Hort. Lugd. 38. (1740), and prae-Linnaeans. *Allium sativum* Linn. Sp. Pl. 425. (1753) = garlic.

274. *Allium stellatum* Ker. Bot. Mag. Pl. 1576. (1813).
Leeds, Butte; Kulm (Brenckle).
275. *Allium Geyeri* S. Wats. Proc. Am. Acad. 14: 227. (1879).
Allium reticulatum deserticola Jones (?).
Pleasant Lake, Dunsieith, Towner, Minot.
276. *Allium reticulatum* Don. Mem. Vern. Soc. 6: 36. (1826-31).
Leeds, Butte.
- Fam. 22. **LILIACEAE** Clusius, Panon 231. (1585). Linn.
Phil. Bot. 28. (1751), 28. (1755); Zinn, Cat. Pl. Gott. 89. (1754);
Haller, Enum. Pl. Hort. Gott. 19. (1753).
- LILIUM* Plinius, Virgilius, Colum. X: 99, Linn. Gen. Pl.
91. (1737), 142. (1742), 143. (1754), Sp. Pl. 302. (1753).
277. *Lilium umbellatum* Pursh, Fl. Am. Sept. 229. (1814).
Lilium andinum Nutt. Fras. Cat. (1813) nomen nudum.
Leeds, Butte, Oberon.
278. *Lilium tigrinum* Andr. Bot. Rep. 9. (1809).
Subspontaneous. Leeds.
- FRITILLARIA* Linn. Sp. Pl. 803. (1753).
279. *Fritillaria atropurpurea* Nutt. Journ. Acad. Phila. 7:
54. (1834).
Medora (Cl. Waldron).
- CALOCHORTUS* Pursh, Fl. Am. Sept. 240. (1814).
280. *Calochortus Nuttallii* T. et G. Pac. R. R. Rep. 2:
124. (1855).
Sentinel Butte (Bergman), Medora (Bergman).
- YUCCA* Linn. Sp. Pl. 319. (1753).
281. *Yucca glauca* Nutt. Fraser's Cat. (1813).
Morton Co.: Wade (Bell).
- Family 23. **BACCIFERAE** Haller, Fl. Helv. 2: 116. (1768).
Convallariaceae Link. Handb. I: 184. (1829).
Subfamily *Asparagoideae* Vent. Tabl. 2: 141. (1799).
- ASPARAGUS* Diosc. 2: 151. Juvenalis, Sat. 5: 82, 9: 69,
Theophr. Plinius, Fuchsius, Cordus, Tour. Éls.; I. R. H.; Linn.
Syst., Hor'. Cliff., Gen., Sp. Pl. 313. (1753).
282. *Asparagus hortensis* Marcellus Virgilius, in Dios. Com.
260. (1529).
Asparagus officinalis Linn. Sp. Pl. 1. c.
Leeds, Butte.
- Subfamily *Maianthemaceae* Dum. Fam. des Pl. 60. (1829).
VAGNERA Adanson, Fam. des Pl. 2: 496. (1763).

Smilacina Desf. Ann. Mus. Paris 9: 51. (1807).

283. *Vagnera racemosa* (Linn.) Morong, Mem. Torr. Bot. Club 5: 114. (1894).

Smilacina racemosa Desf. l. c.; *Convallaria racemosa* Linn. Sp. Pl. 315. (1753).

Fargo (Bergman).

ASTERANTHEMUM Kunth. Enum. Pl. V, p. 151. (1850).

Vagnera Adanson, l. c., segregate.

284. *Asteranthemum stellatum* (Linn.) Nwd. Am. Midl. Nat. Vol. III: 109. (1913).

Convallaria stellata Linn. Sp. Pl. 316. (1753).

Smilacina stellata Desf. Am. Mus. Paris 9: 52. (1807).

Vagnera stellata Morong, Mem. Torr. Club V: 114. (1894).

Asteranthemum vulgare Kunth l. c. p. 152

Leeds, Butte, Devils Lake.

UNIFOLIUM Brunsvigius (1500), Tragus Stirp. Hist. (1552), Dodonaeus Pempt. 20. (1583), Adanson. Fam. Pl. 2: 54. (1763). *Maianthemum* Wigg. Prim. Fl. Holsat. 14. (1780).

285. *Unifolium canadense* (Desf.) Greene, Bull. Torr. Bot. Club 15: 287. (1888).

Maianthemum canadense Desf. Ann. Mus. Paris 9: 54. (1807).

Turtle Mountains: St. John, Dunsieith.

Subfamily *Polygonatae* Benthams, Benth. et Hook. Gen. III: 752. (1883).

POLYGONATUM Diosc. 4: 6. Tour. Éléments 69. (1694). Adanson, Fam. Pl. 2: 54. (1763).

Salomonina Heister, Syst. 5. (1748).

286. *Polygonatum commutatum* (R. et S.) Dietr.; Otto et Dietr. Garteng. 3: 223. (1835).

Polygonatum giganteum Dietr. l. c. 222. (1835).

Convallaria commutata R. et S. Syst. 7: 1671. (1830).

Devils Lake, Peninsula of Lake Ibsen.

DISPORUM Salisb. Trans. Hort. Soc. I: 331. (1812).

Prosartes Don. Ann. Nat. Hist. 4: 341. (1840).

287. *Disporum trachycarpum* (S. Wats.) B. et H. Gen. Pl. 3: 832. (1883).

Prosartes trachycarpa S. Wats. Bot. King's Exp. 344. (1871).

Turtle Mountains: St. John, Dunsieith.

Family 24. TRILLIACEAE De Candolle Ess. Med. 294. (1816)

TRILLIUM Linn. Sp. Pl. 339. (1753), Gen. Pl. 158. (1754).

288. *Trillium cernuum* Linn. Sp. Pl. 339. (1753)
 Fargo (Bergman). Turtle Mountains: St. John.
 Family 25. **SMILACEAE** Vent. Tabl. Reg. Veg. 146. (1799).
NEMEXIA Rafinesque, Neogenyton 3. (1825).
Smilax Linn. Sp. Pl. 1028. (1753), in part.
289. *Nemexia lasioneuron* (Hook.) Rydb. Bull. Torr. Bot. Club (1905), p. 610.
Nemexia herbacea (Linn.) Small, var *melica* A. Nels. Proc. Biol. Soc. Wash. 17: 175. (1904).
 Souris River near Towner.
290. *Nemexia pulverulenta* (Michx.) Small in Fl. SE. U. S. 281. (1903).
Smilax pulverulenta Michx. Fl. Bor. Am. 2: 238. (1803).
 Peninsula of Lake Ibsen, Towner, Turtle Mountains.
 Family 26. **HYPOXIDEAE** R. Brown. Fl. Voy. 277. (1814).
HYPOXIS Linn. Syst. ed. 10, 2: 986. (1759).
291. *Hypoxis hirsuta* (Linn.) Coville. Mem. Torr. Bot. Club 5: 118. (1894).
Ornithogalum hirsutum Linn. Sp. Pl. 306. (1753).
Hypoxis erecta Linn. Syst. Ed. 10, 2: 986. (1759).
 McHenry Co.: Sand Hills; Leeds, Butte.
- Order 14. ENSATAE.**
- Bartling Nat. Ord. p. 40. (1830).
 Family 27. **IRIDEAE** Vent. Tabl. Reg. Veg. 188. (1799).
BERMUDIANA Tournefort, Éléments 306. (1694); I. R. H. 387. (1700); Linn. Syst. (1735); Adanson, Fam. II: 60. (1763).
Sisyrinchium Linn. Gen. 273. (1737), 436. (1742), 409. (1754), Sp. Pl. 954. (1753), not Tour. and older authors=*Iris*.
292. *Bermudiana angustifolia* (Mill.) Nwd. Am. Midl. Nat. Vol. III. p. 115. (1913).
Sisyrinchium angustifolium Mill. Gard. Dict. ed. 7. (1759).
 Leeds, and almost everywhere in the state.
293. *Bermudiana mucronata* (Michx.) Lunell.
Sisyrinchium mucronatum Michx. Fl. Bor. Am. 2: 33. (1803).
 Butte.
294. *Bermudiana septentrionalis* (Bicknell) Lunell.
Sisyrinchium septentrionale Bicknell, Bull. Torr. Bot. Club 27: 243. (1900).
 A Canadian plant. Leeds is the only locality from which it is known within the United States.

Order 15. SYNANDRAE.

Agardh. Aphor. p. 179. (1823).

Family 28. ORCHIDEAE Haller, Enum. St. Helvet. I: 262. (1742).

Subfamily *Cypripediceae* Lindl. Orchid. Sal. 7-18. (1826).

CALCEOLUS (Rivinus) Tournefort, Éléments 343. (1694); I. R. H. 436. (1700); Zinn. Cat. 85. (1757); Adanson Fam. II: 70. (1763); *Calceolaria* Heister, Syst. 5. (1748); *Cypripedium* Linn. Syst. (1735). Gen. 272. (1737), 435. (1742), 408. (1754), Sp. Pl. 951. (1753).

295. *Calceolus hirsutus* (Miller) Nwd. Am. Midl. Nat. Vol. III. p. 118. (1913).

Cypripedium hirsutum P. Miller, Gard. Dict. Ed. 8, No. 3. (1763).

Cypripedium pubescens Willd. Sp. Pl. 4: 143. (1803).

Fort Totten (Bergman).

296. *Calceolus parviflorus* (Salisb.) Nwd. l. c.

Cypripedium parviflorum Salisb. Trans. Linn. Soc. 1: 77. (1791). Leeds, Pleasant Lake.

Subfamily *Ophrydeae* Lindley, Orchid. Seel. 96. (1826).

ORCHIS Theoph. Hist. 9: 19. Also Diosc. 3: 131, 132, Pliny 27. 8, 26: 10, as also of all older writers though often translated into Latin name. *Orchis* Tour. Élé. 343. (1694). I. R. H. 431. (1700) Linn. Syst., (1735) Gen. 270 (1737), 405 (1754).

297. *Orchis rotundifolia* Pursh, Fl. Am. Sept. 588. (1814).

Platanthera rotundifolia Lindl. Gen. & Sp. Orch. 292. (1835). Devils Lake, fide M. U. Brannon.

LIMNORCHIS Rydb., Mem. N. Y. Bot. Gard. I: 105. (1900).

Habenaria Willd. Sp. Pl. 4: 44. (1805).

298. *Limnorchis hyperborea* (Linn.) Rydb. l. c.

Habenaria hyperborea (Linn.) R. Br. Ait. Hort. Kew. ed. 2, 5: 193. (1813).

Orchis hyperborea Linn. Mant. 121. (1767).

Butte, Pleasant Lake, Dunsieith, Willow City.

COELOGLOSSUM Hartman, Handb. Skand. Fl. I: 329. (1820).

Habenaria Willd. l. c., segregate.

299. *Coeloglossum bracteatum* (Willd.) Part. Fl. Ital. III: 409.

Habenaria bracteata (Willd.) R. Br. Ait. Hort. Kew. l. c. 192.

Orchis bracteata Willd. Sp. Pl. 4: 34. (1805).

Butte; Turtle Mountains.

Subfamily *Neottiinae* Pfitz. Entwick. Anord. Orch. 45.
97. (1887).

TRIORCHIS Bauhin, Phytopinax 123. (1596); Gerard, Herbal (1597); C. Bauhin, Pinax 84. (1623); Tabernaemontanus. *Gyrostachys* Pers. Syn. II: 511. (1807). *Ibidium* Salsb., Trans. Hort. Soc. 1: 291. (1812). *Spiranthes* L. C. Richard Mem. Mus. Paris 4: 42. (1818).

300. *Triorchis stricta* (Rydb.) Lunell.

Gyrostachys stricta Rydb. Mem. N. Y. Bot. Gard. 1: 107. (1900).

Leeds (extinct), Butte (extinct), Towner, Devils Lake.

Subfamily *Liparididae* Lindl. Veg. King. 181. (1847).

CORALLORHIZA Ruppius, Fl. Jen. (1718); R. Br. Ait. Hort. Kew. ed. 2, 5: 209. (1813); Gmel. Fl. Sib. I, op. 25. (1747); Haller, Hist. Stirp. Indig. Helv. 11: 159. (1768), also 248. (1742).

301. *Corallorhiza trifida* Chat.

Ophrys Corallorhiza Linn. Sp. Pl. 945. (1753).

Corallorhiza innata R. Br. l. c.

Corallorhiza Corallorhiza (Linn.) Karst. Deutsch. Fl. 448.
(1880-83).

Pleasant Lake.

CORRECTIONS.

Page 221, lines 7 and 8: for **ciliare** . . . *ciliaris* read **cilianense** . . . *cilianensis*.

Page 224, line 14: *Gnomonia* is not valid, being antedated by *Gnomonia*, genus name of a fungus. Substitute *HOROLOGION* (gr. ὁρολόγιον, fescue, dial).

THE NAIADES OF MISSOURI.—IV.

BY WILLIAM I. UTTERBACK.

Uniomerus tetralasmus (Say).

("Pond Horn Shell.")

Pl. XXI, Figs. 69 A and B.

1830—*Unio tetralasmus* Say, Am. Conch., III, pl. XXIII.

1836—*Unio declivis* Conrad, Monog., V, p. 45, pl. XXIII, fig. 1.

1839—*Unio sayi* Ward, (in Tappan). Am. Jl. Sci., XXXV, p. 268,
pl. III, fig. 1.

1912b—*Uniomorus tetralasmus* (Say) Ortmann, An. Car. Mus., VIII, pp. 272 and 273.

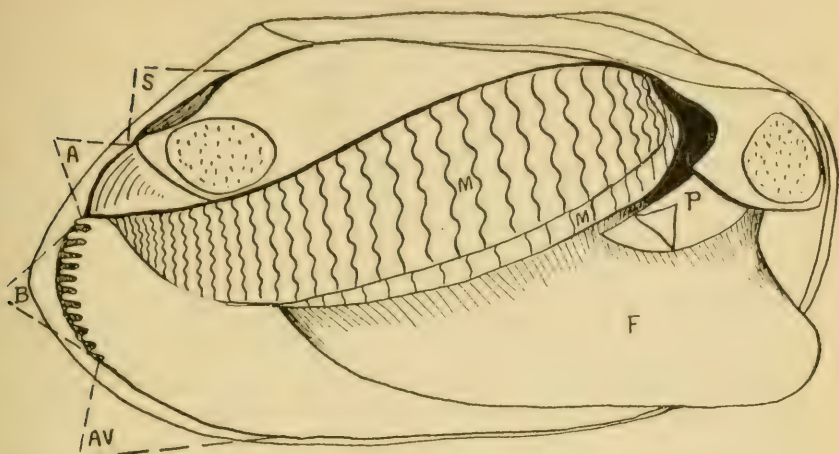


FIG. 4. *Uniomorus tetralasma* (Say) ♀. Diagram of a gravid individual from Lost Cr., Amity, showing animal characters in left valve.
Coll. May 3, 1913. ($\frac{3}{4}$ nat. size.)

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large, set with numerous papillae; anal finely crenulate on inner edge; supra-anal large extending to dorsal line, closed from anal by a moderate mantle connection; gills about the same width, inner longer, inner laminae free from visceral mass for whole length except for a short distance anteriorly; palpi short and broad, connected only for one-fourth of their length antero-dorsad; color of soft parts, for most parts, a dingy white with mantle edge at siphonal openings blackish, gills brown.

REPRODUCTIVE STRUCTURES:—Marsupia only occupying outer gills, when charged rather padiform, distended at center, but not near the ventral edges, ovisacs simple, undivided; conglutinates also undivided, white, sole-shaped, with regular thin transparent areas arranged cross-wise made by the thickening of the septa at regular intervals; glochidia spatulate, very regular in outline, hinge line short and straight, medium in size measuring 0.160×0.210 mm.

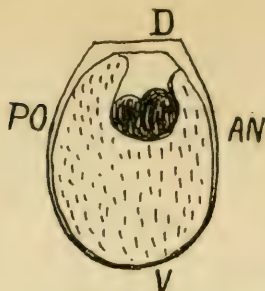


FIG. 5. Mature closed glochidium of *U. tetralasma*. (x87)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subtrapezoid; post-dorsal ridge rather high, usually obtusely pointed behind, evenly rounded in front; disk smooth; beaks low, drawn well back from anterior end, sculptured with many coarse, concentric, regular ridges curved up very abruptly behind at base of post-umbonal ridge where the ridges are drawn closely together; epidermis light yellow back ground with alternated brown bands running parallel with the growth lines, or nearly all colored in brown horn with polished appearance, almost rayless, sometimes faintly rayed in green on post-umbonal ridge.

INTERNAL STRUCTURES:—Cardinals compressed into rather blade-like processes; laterals delicate but rather prominent; interdentum long, thin; umbonal cavities rather shallow; scars well impressed, nacre light bluish to grayish.

Sex	Length	Height	Diameter	Um. ra.	Locality
♂	95	x 45	x 31 mm	0.260	(Batterton Pond, Columbia)
♀	88	x 44	x 32 "	0.265	(Lost Creek, Amity)
♀	76	x 42	x 24.5 "	0.260	(Mill Creek, Courtney)
♀	23	x 12	x 8 "	0.270	(Lost Creek, Amity)

MISCELLANEOUS REMARKS:—*U. tetralasma* is peculiar ecologically, as well as morphologically, in that it can become more quickly established in artificial ponds and lakes than any species. It is naturally lacustrine, but for some unknown cause it is not found in any of our lakes preferring small ponds or quiet creeks where it is found accompanying *Anodonta Danielsii*, or *Eurynia subrostrata*. From the fact that the writer has not found any individuals of this species in North Missouri without marsupial characters he is led to believe that it is *locally hermaphroditic* at

any rate. The writer, too, has had the good fortune to find its glochidium for the first time and is figured here in this catalogue for the first (See Text fig. 5). Many were taken from Lost Creek of the Grand River drainage, May 3d, and also August 5th, most of which were gravid with glochidia on both occasions. Although winter observations have not as yet been made, still we would judge from these two records that this species is not tachytictic as in most *Unioninae*. However, like most of the members of this Sub-Family their conglutinates are "aborted" when removed from their natural bed. Simpson speaks of this species as being very susceptible to variation; however, the writer has not noticed any great variability in this State, where its distribution is rather wide, and has not seen any varieties worth listing except *comptodon*, which has also been reported for Central Missouri by Dr. Britts.

***Uniomorus tetralasmus comptodon* (Say).**

("Pond Horn Shell.")

Not figured.

1832—*Unio comptodon* Say, An. Conch., V, pl. XIII.

1832—*Unio geometricus* Lea, Tr. Am. Phil. Soc., V, p. 28, pl. IV, fig. 10.

ANIMAL CHARACTERS are the same as those of the species; so are also its shell characters except in its outline being more rhomboid, its epidermis being more of a dull drab—or uni-color in having more roughened growth lines and a more curved hinge line.

Sex	Length	Height	Diameter	Locality
♀	80	x 40	x 25mm	(Grindstone Creek, Maysville)
♀	75	x 40	x 24 "	(Lost Creek, Amity)
♀	63	x 33	x 20 "	(" " ")

MISCELLANEOUS REMARKS:—This variety is often found in the same bed with the species from which it is discriminated, as above indicated, by the character of its epidermis. On this superficial basis of epidermis color there are so many intergrades and for this reason it may be doubted whether this and other recorded varieties are really worthy of their names. *Comptodon* was collected by Dr. Britts in Clinton Co., and is now on exhibit in the Division of Mollusks of the U. S. National Museum under the number, 150402. According to Henderson (1907, p.87, pl. ii, figs. 7a and 7b) this variety predominates over the main species in Colorado. Dr. Seammon (1906, p. 337) reports it for Neosho County, Kansas. The writer has examined both sterile and gravid

specimens of this form to find it with the same breeding season as its parent species.

II—SUB-FAMILY *Anodontinae* Ortmann.

1911a—*Anodontinae* Ortmann, An. Car. Mus., IV, p. 336; 1912b, An. Car. Mus., VIII, pp. 278–300.

ANIMAL CHARACTERS:—Mantle edge, antero-ventrad to branchial opening smooth without specialized structures; supra-anal antero-dorsad to anal opening usually widely separated; no tendency toward tubular siphonal openings; inner laminae of inner gill generally free from visceral mass; region just anterior to pericardium of watery composition; palpi very large; marsupia—occupying two entire outer gills, when gravid pad-like, enormous, tissue thickened at edge to permit transverse distention, two water tubes present on either side of an enclosed central undivided ovisac and facing outer and inner laminae, these laminae very thin and delicate rupturing at the slightest scratch; glochidia usually large, spadiform, generally longer than high, with a spine at each ventral tip; no well-defined conglomerates, but held together in unstable masses by brownish mucus and a tangle of larval threads.

SHELL CHARACTERS:—Shell thin for the most part; disk usually without sculpturing; beaks usually coarsely sculptured with concentric or double-looped ridges; hinge variable, teeth completely lacking, or, if present, rudimentary or peculiar; beak cavities not deep as a rule; sexual dimorphism rarely seen.

MISCELLANEOUS REMARKS:—The members of this group have a long period breeding season (bradytictic) due perhaps to their origin at a time, as Dr. A. E. Ortmann considers, when a possible shortening of the warm season induced them to retain their embryos in the marsupia and discharge the glochidia in the spring; hence, the constant and admirable adaptation of water-tubes for the aeration of the embryos in the marsupia while being retained for that time. This adaptation elevates this group from the primitive one and places it more among the modern Unionidae. Even on the basis of shell structure, in that the sculpturing, seen on the disk of the shells of the *Unioninae*, is carried back up to the umbona region where it is almost exclusively confined, there is sufficient evidence for the more modern grouping. The inability of the *Anodontinae* to spread their valves very wide may account for

the lack of papillae or other specialized structures (as related to the processes of reproduction) in the region of the branchial openings. Since the species of this group are mostly lacustrine we find them, of course, mostly distributed in the chain of lakes along the Missouri River or in the ponds and small sluggish streams of the interior of the state north of the Missouri River. Compared to the other sub-families, we do not find so many variations in this Sub-Family due to the more constant ecological conditions to which the *Anodontine* species are remarkably constant—especially as to reproductive structures, in which respect they differ from those of the *Lampsilinae*; however, the *Anodontine* species are like the *Unionine* in the possession of large palpi, whereas those of the *Lampsiline* species are small. In all probability the larger palpi are for reproductive as well as nutritive purposes. It is interesting to note the recapitulation of the evolution of the whole race of *Naiades* in some of the individual members of this Sub-Family in that the coarse sculpturing, noted on the disk of juvenile shells, is carried back up to the umbones in mature shells—a progression from the sculptured disk of the more primitive to the smooth disk of the more modern forms of the adult.

Genus, **Symphynota** Lea.

1829—*Symphynota* Lea, Tr. Am. Phil. Soc., III, p. 424.

(Type, *Symphynota compressa* Lea)

ANIMAL STRUCTURES:—Branchial opening with short papillae; anal smooth, or finely crenulated; supra-anal larger or smaller than anal, separated by more or less long mantle connection; gills bowed ventrad, septa and water-tubes well developed, inner lamina of inner gills free from visceral mass; marsupium occupying outer gills, pad-like and with secondary water tubes, when charged; glochidia large, spadiform, spined, hinge line undulate; palpi sickle-like united for one-half of their length antero-dorsad; color of soft parts usually yellowish.

SHELL CHARACTERS:—Shell elliptical to oval, compressed, smooth except for costae sometimes on posterior dorsal ridge; beak sculpture double looped, or sinuate-concentric; cardinals always present; laterals imperfect, or even absent; nacre white or bluish.

MISCELLANEOUS REMARKS:—The shell characters of *Symphynota* would relate it more closely to the more primitive group than

any of the *Anodontinae* on account of its sculpturing on the posterior dorsal ridge, the costae there being somewhat similar to those on the shell of some *Amblemae* or *Quadrulae*. Simpson treated this genus under three sub-genera and while the shell characters may greatly differ, yet, *the animal characters are so constant and the known species are so few to retain this subgeneric treatment.* The type, *S. compressa* (Lea), is not found in this state—not even in the Mississippi River. Only two species of this genus, *S. complanata* (Barnes) and *cosiata* (Rafinesque), are found in Missouri and they are not widely distributed, the former being confined mostly to the north and the latter to the south part of the state.

Symphynota complanata (Barnes).

("Heel Spitter," "Hackle Back," "Hatchet Back," "Pan-cake.")

Pl. XXII, Figs. 70 A and B.

1823—*Alasmodonta complanata* Barnes, Amer. Jour. Sci. and Arts, p. 278, pl. XIII, fig. 21.

1900b—*Symphynota complanata* (Barnes) Simpson, Proc. U. S. Nat. Mus., XXII, pp. 665-666.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening thickly set with short papillae; anal finely dentate; anus of intestine fringed with three or four papillae; supra-anal large, mantle connection widely separating it from anal; inner gills, wider than outer, inner laminae free except briefly, anteriorly; marsupia occupy entire outer gills, truncated along ventral margin when charged, ovisacs not divided; glochidium very large, spined, hinge line undulate measures 0.310 x 0.320mm; most of soft parts yellowish, gills rusty color when gravid.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Usually rhomboidal, compressed; alae high, marked with a few upcurved costae; disk smooth; beaks low, sculptured with coarse double-looped ridges; epidermis of young shell reddish with brown rays; of old specimens, brown to black.

INTERNAL STRUCTURES:—Cardinals single in right, double in left valve; laterals faintly double in both valves; umbonal cavity shallow; nacre bluish to satiny white with marginal ribbon of

lavender; sexual dimorphism not very distinct; the biangular character elimed for posterior end of male shell not constant.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	170	x 105	x 72mm	0.26	(Big Mud Lake)
♂	175	x 105	x 55 "	0.26	(Platte R.)
♀	100	x 65	x 29 "	0.20	(" ")
♀	88	x 55	x 25 "	0.20	(102 River)

The juvenile shell is very flat, a very beautiful wine-colored epidermis marked with bright brown rays: beaks are coarse, marked with the characteristic sculpturing of adult shell except the later bars are down on the upper part of the disk; nacre bluish.

MISCELLANEOUS REMARKS:—This species is both fluviatile and lacustrine for this state. *Observation of aquarium specimens discharging sperm proves this species a gonochorist*—a character this is opposite to the congeneric species and type of this group, *compressa* Lea. The author has also observed this species to be gravid with glochidia from November to April and, in most instances, has noted early and late embryos mingled with the glochidia in the same individual at the same time. This species is very common in North Missouri where it grows very large in the lakes, but is uncommon and dwarfed in Central Missouri and is not found at all in the clear, swift water-streams of South Missouri. *Complanata* is so distinct from other alated forms that there should be no confusion. It differs from *Proptera alata* (Say) in that the latter is dimorphic more inflated and has a purple nacre. There is such difference between this species and the type (*S. compressa*) that it may well deserve its subgeneric name, *Pterosygna* Raf. (1813), that Simpson applied.

Symphynota costata (Rafinesque).

("Fluted Shell," "Squaw Foot," "Sand Mussel.")

Pl. XXII, Figs. 71 A—F.

1820—*Alasmidonta costata* Rafinesque, Ann. Gen. Sci. Brux., p. 318, Pl. LXXXII, fig. 15, 16.

1823—*Alasmidonta rugosa* Barnes, Am. Jour. Sci. and Arts, p. 278, pl. XIII, fig. 21.

1900b—*Symphynota costata* (Raf), Simpson, Proc. Nat. Mus., XXII, p. 665.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Anal opening slightly crenulated on inner margin; supra-anal moderately separated from anal;

inner gills larger, much wider anteriorly, inner lamina free from visceral mass nearly whole length; palpi not large, triangular, united partly antero-dorsad.

REPRODUCTIVE STRUCTURES:—Marsupium typically Anodontine; glochidium next to largest on record (0.380 x 0.390mm) wider than long, hinge line undulate; soft parts yellow; marsupium, however, rich brown when charged.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell moderately large, thin to moderately thick, elongate, compressed (especially in male), posterior end bi-angulate, costae on slopes of post-dorsal ridge; disk without sculpturing; umbones peculiarly marked with four coarsely mingled concentric and double-looped bars; epidermis from light horn-color to dark chestnut in old specimens, greenish and rayed in young.

INTERNAL STRUCTURES:—Cardinals single in right, rather tripartite in left valve and interdentum deeply notched; laterals almost obliterated; nacre deep rich cream in umbonal cavity, while lavender and blue on pallial border, often whole nacreous surface yellowish or ferruginous due to a distomid infection to which this species is so susceptible.

SHELL MEASUREMENTS.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	116	x 85	x 44mm	0.370	(Gascondy, Mo., Gasconade R.)
♂	125	x 56	x 35 "	0.280	(Black R., Williamsville, Mo.)
♀	100	x 52	x 32 "	0.275	(Miss. R., LaGrange, Mo.)
	75	x 42	x 24 "	0.280	(St. Francis R., Greenville)

MISCELLANEOUS REMARKS:—*S. costata* is found in sandy and muddy situations, is a deep burrower and very active. With this habitat and physiological characters it is strange that it should not be found at all in the sluggish muddy streams of North Missouri and very rarely in Central Missouri where the streams are intermediate for clearness and current. Perhaps this species has the most variegated nacre of any *Naiad* shell. It is a very common species in the clear and rapid streams of the Ozark Plateau and Center where its shell is duller epidermis than those of the Mississippi. (See Pl. xxii, Figs. 71 A--F.) This compression and plication are due, doubtless, to swifter current and more rocky bottom.

Its general distribution is for the St. Lawrence drainage and in the Mississippi as far south as Texas. This species can be easily identified and distinguished from other shells by rugose or ribbed structure on the abrupt slopes of the post-dorsal ridge, by its peculiar deep socket just underneath the beak, by its comparatively unridged laterals, but, most of all, by its very characteristic compound beak sculpturing. Because of these very striking shell characters it may deserve the subgeneric treatment of Simpson (1900b p. 664) who gave this species the name *Symphynota* (*Lasmigona*) *costata* (Raf.) Dr. Ortmann and Mr. Frierson think this subgenus, *Lasmigona*, really deserves generic rank. The author has found the breeding season of *costata* to extend from August until May with eggs and early embryos for late summer and fall and glochidia for winter and spring.

Genus *Arcidens* Simpson

1900b—*Arcidens* Simpson, Proc. U. S. Nat. Mus., XXII, p. 661.

(Type *Alasmidonta confragosa* Say).

ANIMAL CHARACTERS.

Branchial opening densely set with papillae; anal finely serrated; supra-anal long with short mantle connection to anal; inner gills wider in front than outer, inner laminae of inner gills free; palpi large, united two-thirds of their length antero-dorsad; marsupium Anodontine both in external and internal structures; glochidium spined, large, hinge line undulate.

SHELL CHARACTERS.

Shell somewhat rhomboidal, inflated with rather high full beaks; disk and beaks profusely sculptured, the latter coarsely double-looped, the spinuous tuberculed loops extending in two diverging rows upon the disk; the former with oblique folds on the post-ventrad part with pustulated expansions along the post-umbonal ridge; cardinals present but only traces of laterals are seen; nacre white.

This genus is represented in this state by few individuals and while the only species of this genus, known so far, is both fluviatile and lacustrine it is more often found in quiet creeks, head waters of rivers or in other lacustrine conditions of the rivers, such as the pond-like stretches, sloughs, bayous, etc.

Arcidens confragosus (Say).

("Black Pocket-Book," "Black Pocket," "Rock Shell,"
"Rock Pocket-Book.")

Pl. XXII, Figs. 72 A and B.

1829—*Alasmodonta confragosus* Say, N. Harm. Dis., II, p. 339.

1888—*Margaritana confragosa* B. H. Wright, Check List.

1900b—*Arcidens confragosus* (Say) Simpson, Proc. U. S. Nat. Mus. XXII, p. 662.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large, with few papillae; anal with tiny papillae on inner edge; supra-anal very long, connected antero-dorsad two-thirds of length; inner gills somewhat wider, inner laminae free from visceral mass; color of gills and palpi brown, all other soft parts soiled white and chamois like.

REPRODUCTIVE STRUCTURES:—Marsupium occupying only outer gills, light brown when sterile, spotted and vertically striated when gravid with early embryos, padiform and dark brown when gravid with ripe glochidia; internal structure of gravid marsupium typically Anodontine; glochidium of specimen from Platte River, Missouri, (0.355 x 0.350mm.) but possessing same shape, i. e., subtriangular, with undulate hinge line.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subrhomboid, inflated, roughly sculptured with apiculated tubercles in umbonal region, ribbed tubercles on post-umbonal ridge, coarse undulations across post-ventrad part of disk, slopes of post-dorsal ridge sub-costated; beaks full, high, corrugated; epidermis brown to black in adult, greenish mingled with black in youth.

INTERNAL STRUCTURES:—Cardinals single in right valve, double in left, the posterior one being long, serrated and placed just under the beak in place of the interdentum; laterals, faint in both vales; scars rather well impressed; umbonal cavity somewhat deep; nacre bluish to white with sky-blue border.

Sex	Length	Width	Diameter	Um. ra	Locality
♀	103	x 67	x 48 mm	0.30	(Platte R., Mo.)
	102	x 65	x 48 "	0.34	(L. Contrary, Mo.)
♂	115	x 74.5	x 51.5 "	0.31	(Osage R., Mo.)
	45	x 33	x 22.5 "	0.30	(" " ")

The latter measurement is that of a juvenile taken in a cutoff slough at Warsaw, Mo. Like that of other juveniles of this species, its supra-anal opening is found to be rudimentary—a mere furrow—and the gills are specked with minute black pigmented spots. Its shell is more rhomboidal than older; also two rows (five in a row) of ribbed tubercles; more prominent, coarse undulations not so distinct, nor horizontal; more zigzag sculpturing on disk; epidermis more blue-greenish; alae more costated; naere more iridescent and bluish in beak cavities and with a brighter lavender ribbon around the margins.

MISCELLANEOUS REMARKS: *Arc. confragosus* is peculiar in its shell structure by its profuse subspiny sculpturing on disk and beaks, its coarse tubercles—especially on umbonal ridge being smooth dorsad and ribbed ventrad and by its postero-cardinal of left valve being long, coarsely serrate and in place of interdentum. In many characters this shell is like that of *Arkansia wheeleri* W. and O., but differs in not having well developed laterals and in having more profuse and prominent sculpturing. *Confragosus* is fond of quiet water and muddy bottoms; thus it is more lacustrine and when fluviatile it is found in creeks or in the head waters and bayous of the large streams. It has a general distribution from western Indiana to Iowa. Simpson reports it as most abundant in Illinois and is also generally found in the Mississippi and in the states adjoining, although it is, by no means, a common shell anywhere. It is a rare species even for North and Central Missouri where there are more lacustrine conditions and is not found at all in South Missouri. The author has found it gravid with active glochidia the latter part of January and with late embryos in the middle of March and great numbers were examined daily during July and August to find it sterile; thus it is bradytictic.

Genus, *Lastena* Rafinesque.

1820—*Lastena* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 316.

1853—*Leptodea* (Raf.) Conrad, Pr. Ac. N. Sci. Phila., p. 262.

ANIMAL CHARACTERS:—Branchial opening narrow, upcurved, papillose, anal smooth, supra-anal short, widely separated from anal; gills long, tapering posteriorly, outer and inner gills about the same size; inner laminae of inner gills free from visceral mass; palpi subfalcate; color of most exposed soft parts orange, rest of soft parts tan-colored and soiled white; marsupia, rusty color

when charged, ventral edges distended, water canals present. no specialized structure of mantle edge antero-ventrad to branchial opening; glochidium large, broadly spadiform, spined, hinge line straight.

SHELL CHARACTERS:—Shell thin, subalated, smooth on disk; beaks flat, sculptured with four or five rather double-looped ridges; epidermis smooth, polished, rayed in green in the region of the post-umbonal ridge; hinge teeth absent; scars faint, confluent; nacre bluish.

In this state this genus is represented by the two species, *Las. ohiensis* (Raf.) and *suborbiculata* (Say)—the latter not having been completely described hitherto. The author has had convenient access to large beds of *suborbiculata* and has been fortunate in securing specimens gravid with embryos in all stages and with mature glochidia. Neither has the latter been figured nor described before. Because of the fact that the marsupium of *suborbiculata* is more like that of *Arcidens* and that of *ohiensis* closer to *Anodonta* we would group the latter as more modern; then, too, the hermaphroditism and longer breeding season of *ohiensis* would also indicate an advance in being able to perpetuate the race.

***Lastena suborbiculata* (Say).**

("Suborb," "Heel-splitter.")

Pl. IV, Fig. 19a; Pl. IX, Fig. 19; Pl. XXIII, Figs. 73 A—D.

1831—*Anodonta suborbiculata* Say, New Harm. Diss. (Newspaper form); Am. Conch. I, No. II, 1831 (Later date), p. XI.

1867—*Anodon suborbiculatus* Sowerby, Conch. Icon., XVII, Pl. V, fig. 11, II.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening comparatively small, upward curved with many fine orange colored papillae; anal also directed upward, smooth with Y-shaped yellow markings; supra-anal long, far removed from anal by mantle connections; inner gills wider but very little longer than outer, inner laminae of inner gills not connected to visceral mass; palpi rather long, united antero-dorsad about one-third of their length; pericardinal region very large, watery, pinkish-brown in color; foot, long, thin, deep orange in color, adductors also orange, yellowish retractors and protractors visible through the watery, transparent

soft parts; gills olivaceous; patch in front of branchial opening light tan or chamois-like; cerebral ganglia bright orange spots external and on top of foot antero-ventrad to palps.

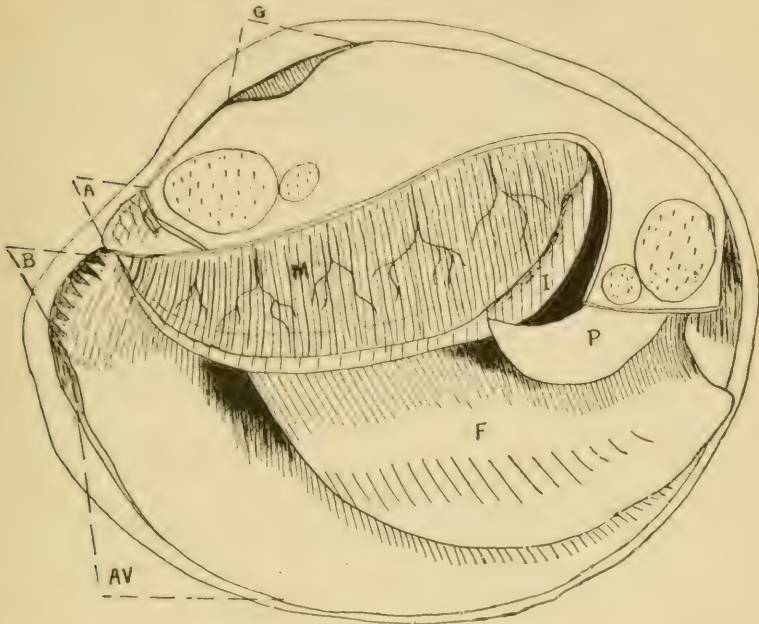


FIG. 6. *Lastena suborbiculata* (Say) ♀. Diagram of a gravid individual from Lake Contrary, St. Joseph, showing animal characters in left valve. ($\frac{3}{4}$ nat. size.)

REPRODUCTIVE STRUCTURES:—Marsupia when sterile, dark tan with crowded septa, tissue of ventral edge thickened, occupying outer gills only; when gravid, russet, with heavy septa more widely separated, distinct, veining enormously pad-like, greatly distended and faintly scalloped ventrad, longitudinal line, near and parallel to the ventral margin, indicating terminations of gill filaments; water canals next to thin laminae on either side of an undivided central ovisac which is closed at the base; no sexual specialization on margin of mantle antero-ventral to branchial opening (thickened edges here have nutritive function of siphonal contraction); glochidium spined, very large, broadly spadiform, hinge line straight, longer than high, (0.325 x 0.320mm.) glochidial shell russet color, bluish spots for the adductors; no conglutinates

but glochidia are held together in loose masses by brownish mucus and coiled larval threads.

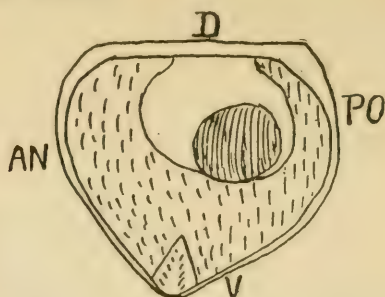


FIG. 7. Mature closed glochidium of *L. suborbiculata*. (x87.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subround, or suborbicular, thin, compressed, rounded before, bowed ventrad, pointed behind, sulcated post-dorsad, alated, dorsal line from apex of wing to anterior end, straight and at an angle of 45 degrees; disk smooth; beaks flattened, sculptured with coarse wavy bars, intermediate ones bow-shaped and arched toward apex, latter double-apiculated with smaller tubercles just ventrad, later bars subundulate on upper disk and running more or less parallel with growth lines; epidermis polished, straw colored in young light brown-horn in old; rayed all over with green capillary lines and one or two broad bluish-green bands from beak to extreme posterior point of shell; growth lines raised and undulated showing through on nacreous surface.

INTERNAL STRUCTURES:—Cardinals and laterals entirely lacking; anterior adductor muscle scars two comparatively deep elongated triangular areas, progressive impressions most distinct; other cicatrices very faint, confluent, mantle line broken by minute ridges; umbonal cavity shallow; nacre whitish, bluish or coppery, iridescent.

Sex	Length	Width	Diameter	Um. ra.	Locality
♀	185	x 130	x 67mm	0.290	(Lower L. Contrary, St. Joseph)
♂	150	x 117	x 49 "	0.270	(Upper L. Contrary, " ")
♀	47	x 35	x 14 "	0.260	(Sugar Lake, Armour, Mo.)
♂	34	x 23	x 9 "	0.250	(L. Contrary, St. Joseph, Mo.)

The latter measurement is that of the smallest juvenile of this species out of a collection of a little over a hundred of these delicate shells. This one was without byssi and doubt is expressed

as to whether any of the lacustrine *Anodontinae* are byssiferous, since the quiet water of the lake would perhaps make these threads unnecessary. The specimen above measured has a very thin, papery shell, almost transparent; ground-glass-like inside view, yellow-horn color outside appearance, beautifully rayed in green especially on post-umbonal slope. In life the heart beat could be detected through the thin shell and the alimentary tract traced; the heart beat 28 times per minute, regular but feeble, while that of an adult was only twenty-two times per minute, irregular but strong.

MISCELLANEOUS REMARKS:—This species is especially characteristic for the shape of its shell being not variable, but somewhat like an ordinary dinner plate as to form and size; also the very distinct progressive impressions are somewhat characteristic. Its shell is the largest in outline of any of the *Naiades*, although it is not heavy,—even with its soft parts. Its meat has been tested through Domestic Science to be of great food value. Except for greater inflation, in case of the female shell, no real sex dimorphism can be detected. The author has noted more of a greenish granular appearance for the outer gills of the male. The fact that the writer has discovered, from aquarium observations, *individuals discharging sperm on two occasions disproves that it is hermaphroditic*. For reference one of these males was killed and preserved in the act of discharging its sperm.

This discharge of sperm made the water milky and when examined by a high-power (X385) lens it was observed to be the flagellated sperm in cysts rolling about through the water like the colonial *Protozoa*. Then, too, the simple test that *not all individuals have the crowded septa of the outer gills* disproves that all have marsupial characters of these gills. Thus *hermaphroditism can not be applied to this genus Lastena, as a general character, if this species is to remain with it*. This is the *first description of the animal of this species that has been drawn up and the author has been the first to report its mature glochidium* which in general shape is about like that of *A. grandis* having about the same shape with the same straight hinge line, but being smaller. The glochidium is very active, having been observed to snap fifteen times per minute. The habitat of *suborbiculata* is that of black sand and mud bottoms in deep quiet water, is a rare shell in general distribution, but, when found, is abundant. Simpson reports it for Nebraska, Iowa,

Illinois, and Louisiana. Dr. W. S. Strode reports it as very large typical and abundant in Illinois and the fact of its southern range to Louisiana (as reported by Mr. Frierson) is interesting. Although this mussel is very susceptible to the attacks of the parasite, *Atax*, its shell is hardly ever distorted for that reason; neither is the shell hardly ever eroded or injured by chemical reaction. An accurate breeding record, kept by the writer, shows it to be a long period breeder, but not so long or continuous as that of *Las. ohiensis* (= *imbecillis*.) It is found to be with early and late embryos from September to December, and mature and immature glochidia from December to March, but sterile for the remaining months.

***Lastena ohiensis* Rafinesque.**

("Paper Pond Shell.")

Pl. XXIII, Figs. 74 A and B.

1820—*Lastena ohiensis* Rafinesque, Ann. Gen. Sci. Brux., V. p. 316.

1829—*Anodonta imbecillis* Say, N. Narm. Diss. II, p. 355.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with yellowish tentacles pointed upward, anal narrow, smooth supra-anal small, far removed from anal; outer and inner gills about the same size, inner laminae free from visceral mass; palpi long, sickle-shaped, united antero-dorsad about two-thirds of its length; foot, adductors branchial opening region orange color, rest of soft parts tannish or dirty white.

REPRODUCTIVE STRUCTURES:—Marsupia rusty brown and pad-like with water-tubes and undivided ovisacs when gravid; mantle edge antero-ventrad smooth without sexual specialization; glochidium golden russet, broadly spadiform, spined, hinge line straight, longer than high (0.310 x 0.290mm.); no conglutinates; glochidia enmeshed in a tangle of larval threads.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subelliptical and subcylindrical, thin, inflated, slightly alated; disk smooth, shining; beaks flush with dorsal line sculptured with coarse looped bars, later ones being finely tuberculated, apex doubly apiculated; epidermis grass green, to olive with post umbonal slope marked by two or three bluish parallel rays.

INTERNAL STRUCTURES:—Teeth entirely lacking; muscle

sears faintly impressed, confluent; branchial cavities large; nacre pearl blue.

Sex	Length	Height	Diameter	Um.ra.	Locality
♀	98	x	40	x 39mm x 0.320	(Mud Lake, Kenmoor, Mo.)
♂	63	x	34	x 31 " x 0.340	(Lower Lake, St. Joseph, Mo.)
♀	61	x	28	x 35 " x 0.360	(Spring Lake, Monegaw Spgs. Mo.)
♂	25	x	10	x 2 " x 0.330	(Mud Lake, Halls, Mo.)

The latter juveniles of the last measurement has the least diameter that the author has ever examined. It was discovered in very active locomotion in shallow water along the lake beach and wonder was expressed how such a compressed shell could contain enough musculature for such vitality. Its beak sculpture presents two apiculations at the apex of the umbone surrounded by rather wavy or looped bars extending low to the disk. So thin were the valves and soft parts that when studied with the lens the heart action could be observed through the shell when held up to the light. The characteristic green rays, extending parallel along the post umbonal ridge area, are more pronounced here than in the adult shell.

MISCELLANEOUS REMARKS:—The vitality of *ohiensis* of the embryos in the active rotary motion is seldom seen in the *Naiades*. This motion was observed to take place around one axis from right to left in very rapid rotation. Mr. L. S. Frierson states that he has seen the glochidium taken from the mother and so sufficiently metamorphosed as to turn its shell up from a glass slide through an angle of 180 degrees.* The fact, too, of this species being *normally hermaphroditic* gives it a character possessed by few *Naiades*. The adult shell is also so peculiar that there is no need for confusion in making identification. The nearest to it in general form and color is *Lasmonos leptodon*, yet it can be easily distinguished from this distant relative by the beak sculpture and hinge. Its suppressed umbones flush with the dorsal line, making "beakless beaks," are perhaps its recognition marks. It is a lover of quiet, shallow water and muddy bottoms and for this reason is distinctly lacustrine. The author has found it in

* Dr. A. D. Howard has lately discovered *Lastena ohiensis* as also non-parasitic in its glochidial life and accounts for its distribution through the buoyancy of its juvenile shell as a compensatory provision for the loss of the usual means of distribution by fishes. (Science, N. S., XL, pp. 353-355, Sept. 4, 1914).

the main body of rivers but in such cases there was always some slough, bayou, or lake near by from which its light shell may have been carried over in time of flood. This species has a general distribution over the Mississippi and St. Lawrence basins. In this state it is confined to the lake district of N. W. Missouri, and in the lacustrine conditions of Central and South West Missouri. Its breeding season seems to be continuous for the year, or at least there is a very short interim of sterility. The author examined it nearly every month of the year to find it gravid and that, for the most part, with mature (active) glochidia. The "eye spots," mentioned by Simpson, as characteristic marks on the mantle edge at the branchial opening, have not been observed by the writer. Because of its Anodonta-like marsupia, but more on account of its physiological characters, in *being a hermaphrodite with an almost continuous breeding season, this species should be assigned to a little higher position in the genus than suborbiculata*. The fact that Rafinesque used *ohiensis* as the type for his genus *Lastena* and also because of such departure in anatomical and conchological features from those of the genus *Anodonta* for *ohiensis* and its nearest ally, *suborbiculata*, this genus *Lastena* should now be employed for these two species of this State.

Genus, **Anodonta** Lamarck.

1799—*Anodonta* Lamarck, Prodrôme Class. Coq., p. 87.

1817—*Anodontes* Cuvier, Règne. An., II, p. 472.

(Type, *Mytilus cygneus* Linnaeus).

ANIMAL CHARACTERS:—Branchial opening with yellowish papillae, anal smooth to slightly crenulated; supra-anal generally small, removed from anal by long mantle connection; inner lamina of inner gills free from one-half to entire length; palpi usually long and large; only outer gills marsupial, when marsupia are gravid, ventral edge distends and secondary water-tubes appear, ovisacs simple, undivided, dark brown when gravid with mature glochidia; no conglomerates formed; glochidia large, brownish, spined, spadiform.

SHELL CHARACTERS:—Shell elliptical, inflated, thin, slightly alated; disk smooth; beaks full high, sculpturing distinct, double-looped, angled upward centrally; epidermis polished, brightly colored; hinge teeth completely lacking.

No genus is so susceptible to so many mutations, yet it is

really only represented in this state by *A. grandis* and *Danielsii*. However, the latter, even may only be a creek form of *grandis*. A few other species, reported for this state under this genus, have doubtless received their names without deserving them and hence will only receive passing notice. The members of this group being lacustrine, they are limited more to the lake distinct in Northwest Missouri, to that portion of Central Missouri where lakes, ponds and sloughs abound, and to the Mississippi Lowlands of Southeast Missouri. Very few *Anodontae* are reported for South Missouri where lacustrine conditions are rare.

***Anodonta grandis* Say.**

("Floater.")

Pl. VII, Fig. 15; Pl. XXIII, Figs. 75 A and B.

1829—*Anodonta grandis* Say, N. Harm. Diss., II., p. 341.

1852—*Anodonta opaca* Lea, Rr. Am. Phil. Soc., X, p. 285, pl. XXV, fig. 46.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with rather long yellowish papillae; anal directed upward, smooth; supra-anal separated from anal by long mantle connection, small, almost closed in some instances; inner gills wider and longer, inner laminae entirely free from visceral moss; palpi very large united antero-dorsad about one-half of their length; anterior portion of pericardial region thick and watery; color of gills usually dark brown, mantle edge at siphonal openings blackish, palpi cream to purplish, remaining parts mostly tan or soiled white.

REPRODUCTIVE STRUCTURES:—Marsupium occupying outer gills only, when gravid pad-like, distended at ventral edge, secondary water canals present, undivided ovisacs in center, laminae very delicate rupturing at slight touch; sterile marsupia thickened at edges to allow for distention; *glochidium largest on record*, (0.400 x 0.395mm.), spadiform, spined, russet color, straight hinge line; no conglomerates, glochidia held in loose mosses by brownish mucus and tangles of crinkled larval threads.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subovate, large, greatly inflated especially in umbonal region, subalated, subsolid anteriorly,

rounded before, pointed behind; disk unsculptured; beaks full, apices recurved, sculptured by several coarse irregular double-looped ridges the loops being more or less nodulous; epidermis glossy, varied in color from brown-horn to green, growth lines rather undulated.

INTERNAL STRUCTURES:—Hinge teeth completely lacking; muscle scars not well impressed, progressive impressions most evident; umbonal cavities large and deep especially in female shell; nacre variable naturally from whitish, or bluish to coppery or even to salmon chocolate or brick-red, iridescent. Probably the latter colors are more pathologic than normal.

Sex	Length	Width	Diameter	Um. ra.	Locality
♀	215	x 118	x 84mm	—0.360—	(Mud Lake, Kenmoor, Mo.)
♂	155	x 80	x 66 "	—0.285—	(L. Contrary, St. Joseph, Mo.)
♀	105	x 63	x 50 "	—0.380—	(" " " " " ")
♀	16	x 11	x 5 "	—0.300—	(" " " " " ")

Several of these juvenile shells of *A. grandis* (the latter measurement being the smallest) were found in one spot on the west beach of Lake Contrary. These juvenile shells were identified by Dr. A. D. Howard of the U. S. Fisheries, Biological Station, Fairport, Iowa, where experimental rearing of these species from the glochidium has been made and a series of shells have been obtained all the way from its larval to its independent and mature life. At the end of the fifth year it is identical with that of *Lea's opaca*. The juvenile of the above measurement is very thin and papery almost transparent, is coarsely sculptured even on its disk—the bars being decidedly double-looped with a re-entering angle between the nodulous loops terminating at the tip of the umbone in two minute conical tubercles. It is especially to be noted that single laterals are faintly seen in each valve of this juvenile shell; also double right and single left cardinals may be seen with a (x12) lens.

MISCELLANEOUS REMARKS:—Perhaps no species of *Naiades* is so polymorphic as *A. grandis*. Probably these mutations are only zoogeographical expressions of its shell which seems to respond most readily to every change in ecological relations. Its pliable juvenile shell may be so shaped by its environment as to give rise to its many varietal forms. By choice *grandis* is lacustrine under which conditions its shell is typically inflated, shorter and thinner; if subjected even to the mild fluvial action of a creek

it becomes thicker and more compressed and more elongated. Its changes are so great at different ages that many names have given it for this reason; doubtless *A. opaca*, *stewartiana*, *leonensis*, etc., are mere synonyms for this reason. Because of parasitism, pounding of the surf, etc., this species is found in many pathologic forms in our lakes; a common one being that of a shell deeply sulcated at the post-ventral point and another with its shell extremely truncated post-dorsad. To the latter *A. footiana* and perhaps *A. dakotana*, may be referred. *A. salmonia* may also be assigned to a *grandis*-form that has a blistered salmon-colored nacre due to a distomid infection. *A. grandis* has a general distribution all over the Mississippi drainage, also in the St. Lawrence drainage and that of the Red River of the North. In this State it is found in most of its forms in the chain of lakes, "cutoffs," sloughs and bayous along the Missouri River and quiet, muddy creeks of the north and central portions. It has only been rarely reported for the Ozark Center or Plateau. The soft parts of the half-grown *grandis* (*A. opaca*) are found by Domestic Science tests to be very edible. A strict breeding record, kept by the author, shows this species to be gravid with glochidia from December until March and sterile from this month on to September; therefore it is a long period breeder and its larvae are the largest and most active known, contracting from ten to fifteen times per minute. The species which follow in description under this genus are only believed to be as mere forms of *grandis* and only receive separate notice because of their original report for this state, under these names,—and are so grouped for sake of conformity to other writers.

Anodonta dakotana Frierson.

("Dakota Shell," "Short Nose.")

Pl. XXIV, Figs. 77 A and B.

1914—*Anodonta dakota* Frierson MS.

ANIMAL CHARACTERS:—With the exception of shorter, wider gills, due to the shape of shell, the nutritive and reproductive structures of this species (if it be one) are identical with those of *A. grandis*. Its marsupium, in gravidity, is exactly the same; so are its glochidia in form and size (0.400 x 0.395mm.).

SHELL CHARACTERS:—Shell subrhomboidal, short, obese, abruptly truncated behind and, with the exception of not being

flat on the center of the disc, it may not be the typical *dakota* of Frierson. In other respects the shell structures are identical with those of *A. grandis*.

Sex	Length	Width	Diameter	Locality
♀	114	x 78	x 48	(L. Contrary, St. Joseph, Mo.)
♂	108	x 73	x 49 "	(L. " " " ")

MISCELLANEOUS REMARKS:—This truncated form may only be the result of a local reaction on *grandis* as it is not often found in very quiet water but in the more disturbed water near the shore, yet its occurrence in such a constant shell-form is so common in our Missouri lakes that it would be safe to assign it to the definite species herein referred, or at least its subspecies. Dr. Ortmann thinks this form may bear the same relation to our western lakes as *A. benedictis* (a form of *grandis-footiana*) does to Lake Erie where it is grown close to the shore in the surf.

Anodonta corpulenta Cooper.
("Big Floater," "Slop Bucket.")

Not figured.

1834—*Anodonta corpulenta* Cooper, App. to Narrative, Exp. Miss. R. to St. L., p. 154.—B. W. Wright Check List, 1888.

ANIMAL CHARACTERS:—The nutritive and reproductive structures are identical with those of *A. grandis*; however, its glochidium is different in shape and size, having an irregular, undulate, hinge line with length and depth equal (0.350 x 0.350mm.).

SHELL CHARACTERS:—With the exception of a shorter, wider, more inflated shell and also of more recurved beaks the shell is the same as that of *A. grandis*.

MISCELLANEOUS REMARKS:—Some students of *Naiades* are inclined to call *corpulenta* an "overgrown *grandis*." However, its smaller, but most of all, its differently formed glochidium would separate it from *grandis* since nothing is so constant as glochidial characters. This form is reported as rather common in the sloughs and lakes along the Mississippi in this state; yet it is not found in the lakes of North-west Missouri. Simpson reports it for the Missouri river (1900b, p. 646) but is not specific about the locality and states that it has a general distribution for the upper Mississippi River east to Indiana and south to Texas where it may be replaced by *A. stewartiana*. Dr. Surber (1913, p. 106, Pl. XXIX, fig. 1) has found this species to be an occasional fin-parasite upon

the same host as that for *Fusconaia ebena*. Its breeding season is the same as that of *A. grandis*.

Anodonta Danielsii Lea.

("Daniel's Shell.")

Pl. XXIV, Figs. 76 A and B.

1858—*Anodonta danielsii* Lea, Proc. Ac. N. Sci. Phila., III, p. 113;

Jl. Ac. N. Sci. Phila., 1860, IV, p. 365, Pl. LXIII, fig. 190.

1859—*Anodonta texasensis* Lea, Proc. Ac. N. Sci. Phila.; p. 113; Jl.

Ac. N. Sci. Phila. 1860, p. 366, Pl. LXIII, fig. 191.

ANIMAL CHARACTERS:—Branchial opening wide, densely papillose, anal smooth, supra-anal small, far removed from anal by mantle connection; palpi large, united two-third of their length antero-dorsad; inner laminae of inner gills free from visceral sac.

REPRODUCTIVE CHARACTERS:—Marsupia occupying outer gills, when charged pad-like, ventral edge blunt, greenish posteriorly, rest rusty brown; glochidia not found so far.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subelliptical, moderately large, subsolid; disk smooth; beaks rather low, sculptured with coarse double loops radiating from the beaks; epidermis dark horn with areas of green between the dark lines of growth.

INTERNAL STRUCTURES:—No teeth; scars faint; umbonal cavity shallow; nacre pearly-blue to light salmon with bluish border.

Sex	Length	Width	Diameter	Um.ra.	Locality
♀	115	x	55	x	40mm—0.304—(Lost Creek, Amity, Mo.)
♂	180	x	65	x	42 " —0.290—(Tarkio R., Craig, Mo.)
♀	82	x	42	x	30 " —0.268—(Flat Cr., Sedalia, Mo.)
♀	50	x	30	x	17 " —0.280—(" " " ")

The last measurement is that of the smallest and youngest *Danielsii* that has been obtained. It is a beautiful grass-green shell with a single brown band running parallel with the growth lines. Its beak sculpture is the most distinct of any in the writer's collection and is typically Anodontine. Its soft parts are tannish and the outer gills are plainly marsupial.

MISCELLANEOUS REMARKS:—This species is a rather common creek form of *grandis*. It is especially characterized by a more elongated, compressed and smaller shell. As a rule its shell is also thicker and its epidermis takes on more of a greenish color

with alternate brownish bands. It is striking to note such a close likeness of its shell to that of *Uniomorus tetralasma* with which it often accompanied in our muddy, sluggish creeks of North Missouri. Of course it can be distinguished from the latter by its very different umbonal sculpturing and by the absence of teeth. Mr. Bryant Walker very kindly identified this species and stated that the shells were more compressed than those from Oklahoma and Kansas and that he had practically the same shells in his collection from South-west Missouri under the names of *Anodonta texasensis* Lea, but, being a doubtful species, it may equal to *Danielsii*, or at any rate the latter has priority. Hence, we are placing *A. texasensis* in the synonymy of this species. Simpson treats *texasensis* as very near *Danielsii* and, although he had only a young, broken shell from Lea's collection for study, yet he is very doubtful about the validity of it as a species and thinks it may only be a mere variety of *grandis* after all.

Anodonta Bealei Lea.

("Beale's Shell.")

Not figured.

1863—*Anodonta bealei* Lea, Pr. Ac. N. Sci. Phila., VII, p. 194; Jl. Ac. N. Sci. Phila., VI, 1866, p. 26, Pl. IX, fig. 25.

The writer, not having seen this species, would infer from Lea's figure that it is the same as *A. Danielsii*, or near. Through the kindness of Dr. Dall, curator of the Division of Mollusks for the U. S. National Museum, report was made that Dr. John H. Britts, (deceased), a well-known conchologist of this state, collected shells of *A. Bealei* from the Grand River, Henry County, Missouri and sent them to the National Museum where they are now deposited under the numbers, 150,392 and 150,391. Simpson states the geographic distribution of this species from Texas to Kansas.

Genus, Anodontoides Simpson.

1898a—*Anodontopsis* Simpson (in Baker), Tr. St. Louis Ac. Sci., VIII, p. 76.

1898b—*Anodontoides* Simpson (in Baker), Moll. Chicago, p. 72.

ANIMAL CHARACTERS.

"Animal with marsupium occupying the outer and sometimes the four leaves of the branchiae, ovules more numerous in the

outer, the whole pad-like; gills large, inner semi-circular, free from the abdominal sac or united with it; branchial opening large with many small, papillae; anal with well developed papillae." (Simpson.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-elliptical inflated, thin; disk smooth; beaks somewhat full with distinct beak sculpture consisting of concentric ridges upcurved behind; epidermis dark brown, polished, sometimes rayed; hinge-teeth lacking, or merest rudiments, scars shallow; nacre bluish white.

Dr. Ortmann considers this genus practically an *Anodon* with concentric beak sculpture and as a good connecting link for *Anodonta* and *Alasmidonta*. The only species of this genus, *ferussacianus*, is only represented along the Mississippi of this state where it is a rare shell. Unfortunately the soft parts, have not been secured for description. The glochidia of the species and subspecies (*subcylindricus*) of this genus have the same shape and measure 0.32 and 0.33mm. respectively—height and length being equal.

Anodontoides ferussacianus (Lea).

("Ferussac's Shell.")

Pl. III, Figs, 7a—8a.

1834—*Anodonta ferussaciana* Lea, Tr. Am. Phil. Soc. V, p. 45, pl. VI, fig. 15.

1898—*Anodontoides ferussacianus* (Lea) Baker, Moll. Chicago, Pt. 1, p. 72, pl. III, fig. 6; V, fig. 2.

ANIMAL CHARACTERS.

According to Dr. Ortmann (1912b, p. 294) the anatomy of this species is essentially that of *Anodonta* and differs only in the shorter mantle connection between the anal and supra-anal and in the anal being distinctly papillose. The glochidia (Ortmann 1811b, pl. 89, fig. 12) are described as rather small (0.320 x 0.320 mm.) for the subfamily, subtriangular and spined.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subelliptical, thin, inflated, medium in size, post-umbonal ridge rather faint; compressed with distinct, regular, concentric ridges bent up behind and apiculated at the apices; epidermis brownish to bluish-green, some-

times rayed; hinge teeth rudimentary, usually lacking; muscle scars faint, confluent; nacre whitish or pearl blue.

Length	Width	Diameter	Um. ra.	Locality
48	x 29	x 18	—0.280—	(Miss. R., Hannibal, Mo.)
47	x 28	x 20	—0.2850—	(Miss. R., Hannibal, Mo.)

MISCELLANEOUS REMARKS:—Probably this species can be best characterized by its medium sized, sub-elliptical shell with its concentric, umbonal sculpturing, polished olive-green or brownish epidermis and slightly incurved hinge in front of beaks. *A. ferussacianus* is only known to occur for a certainty in the Mississippi of this state. Old, eroded shells from the Niangua River, Camden, Co., and from Casteel Creek, Clinton Co., have structures of this species more than anything else, but the identification is too doubtful for much consideration. The shell of this species is like that of *Strophitus*, but differs in beak sculpture; it also differs from some similar shells of *Anodonta* by the incurved anterior hinge to the beaks and by a compressed post-dorsal portion of shell back of a slight posterior ridge. Ortmann (1921b, pp. 293-294) denies that all four of its gills are marsupial, and Simpson, who claims to have found embryos in all four gills does not class this species under his *Tetragenae* (i. e., those that have all four gills marsupial) because its characters of shell and nutritive soft parts seem to agree better with his *Homogenae* (*Unios* with only outer gills marsupial.) This species is generally distributed throughout the Mississippi drainage, the St. Lawrence system and that of the Red River of the North. The subspecies only occur in the St. Lawrence drainage.

Genus *Alasmidonta* Say.

1818—*Alasmidonta* Say, Jl. Ac. N. Sci. Phila., I., p. 459.

1840—*Uniopsis* Swainson, Tr. on Mal., p. 382.

ANIMAL CHARACTERS.

Mantle connection between anal and supra-anal openings moderately long; inner laminae of inner gills free from visceral mass, or, more or less connected to it; outer gills only marsupial; when charged, distended at ventral edges, water canals facing laminae present, central ovisacs undivided; no conglomerates, embryos held in mucus masses; glochidium large, spined, sub-triangular, hinge line straight, or nearly so.

SHELL CHARACTERS.

Shell subquadrate to subtrapezoidal, thin, inflated; disk smooth; beaks heavily sculptured with irregular concentric bars—the later ones being more or less undulate; epidermis olivaceous to burnt orange with broken rays; cardinals present, laterals reduced; beak and branchial cavities deep; nacre white to pearl blue.

The characters of the shell of this genus—especially in its coarse concentric beak-sculpture—shows that it is somewhat primitive, yet the tendency of the union of the inner laminae of the inner gills with the visceral mass in an indication of progress in structure. The two species that represent *Alasmidonta* for this State are not found in the interior north of the Missouri River.

***Alasmidonta calceolus* (Lea).**

("Slipper Shell.")

Pl. XXIV, Figs. 79 A—D.

1830—*Unio calceola* Lea, Tr. Am. Phil. Soc., III, p. 265, pl. III. Fig. 1.

1898—*Alasmodonta deltoidea* Baker, Moll. Chicago, Pb. I., p. 63, Pl. VI, fig. 2; VII, fig. 4.

1900b—*Alasmidonta calceola* (Lea) Simpson, U. S. Proc. Nat. Mus., XXII, p. 668.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Siphonal openings large, mantle edges with regular blocks of black; gills of medium size, inner laminae partly united with visceral mass; palpi rather long, tongue shaped; most of soft parts light yellowish.

REPRODUCTIVE STRUCTURES:—Marsupium pad-like and brownish when charged, water-canal present; glochidium large, spined, spadiform, longer than high, hinge line straight.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, slipper-shaped or subtrapezoidal, obtusely angular behind, post-umboidal ridge rounded; disk smooth; beaks high, pointed, with coarse concentric sculpturing consisting of four or five bars sharply bent in behind; epidermis yellowish or olivaceous with wavy double rays on and parallel to the post umbonal ridge.

INTERNAL STRUCTURES:—Cardinals single and conical in right valve, double in left with post tooth saddle-shaped; laterals mere thickened hinge line; nacre white.

Sex	Length	Width	Diameter	Locality
♀	35	x	24	x 18 " —(White R., Hollister, Mo.)
♂	26	x	18	x 10 " —(Jack's Fork, Shannon Co.)
♀	18	x	11	x 7.5mm—(Jack's Fork, Shannon Co.)

The latter is a juvenile, tawny in color, with beak sculpture extending well out upon the disk in undulated bars, showing here, as in so many of the *Anodontinae*, that in the adolescent shell there is more of tendency toward disk sculpture in the individual, just as seen in the primitive shell of the whole race of *Naiades*.

MISCELLANEOUS REMARKS:—This species is easily identified by its small shell (being never much more than an inch and one-half long), by its slipper-shape and by its coarse concentric sculpturing. It is a great burrower and, although it may be abundant, it may escape notice because of this habit. For this state *calceolus* is only found in the streams of the south slope of the Ozarks where it is found in company with its nearest relative *Alas. marginata*, and is found in greatest numbers in Jack's Fork of the Current River, Shannon County. It is found rather common in the streams of Arkansas, and has a general distribution in the Ohio, Tennessee and Cumberland Rivers; also the Lower and Middle St. Lawrence systems. Being found with mature glochidia in late Fall it can be classed as bradytictic.

***Alasmidonta marginata* Say.**

("Nigger Toe," "Elk Toe.")

Pl. XXIV, Figs. 78 A and B.

1819—*Alasmidonta marginata* Say, Nich. Inc., No. 1.

1843—*Alasmidonta corrugata* DeKay, Zool. of N. Y., Pt. 5, p. 198, Pl. XXIV, fig. 259.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal with fine papillae; supra-anal moderately separated from anal, mantle-edges marked with squarish black blocks at regular intervals; outer gills wider than inner; inner lamina of inner gills connected with visceral mass; palpi very long and united for one-half of their length antero-dorsad; foot very long and powerful, orange colored; other parts tannish colored.

REPRODUCTIVE CHARACTERS:—Marsupium with wavy crowded septa when sterile; greatly distended when gravid, bluish with

late embryos, brown with glochidia, ventral edge truncated, water canals on either side of undivided ovisacs; glochidia large, spined, spadiform, hinge line undulate, height greater than length (0.350 x 0.300mm.).

SHELL CHARACTERS.

EXTERIOR STRUCTURES:—Shell subrhomboidal, inflated—extremely so along the sharply angled, post-umbonal ridge; post dorsal ridge low with broad gentle slopes finely costated; disk smooth; beaks long full, sculptured with heavy concentric bars, the later ones undulated low almost to disk; epidermis smooth, polished, with spotted, greenish rays from anterior portion of shell to posterior ridge.

INTERIOR STRUCTURES:—Cardinals single in each valve, interdentum displaced by saddle-shaped tooth in left valve; laterals reduced to rounded edges; muscle cicatrices faint; shell cavity deep; nacre whitish to pearl blue and pinkish.

Sex	Length	Width	Diameter	Locality
♀	75	x 40	x 34	mm—(Gasconade, R., Gascondy, Mo.)
♂	60	x 31	x 24	" —(" " " " ")
♀	66	x 35	x 24	" —(Jack's Fork, Shannon, Co. Mo.)
♀	37.5	x 21.5	x 11.5	" —(" " " " ")

The juvenile of this last measurement presents the same sculpturing as in the juvenile *calceolus* except that the bars are somewhat more elongated in *marginata* and are really lower and coarser extending down well on the disk.

MISCELLANEOUS REMARKS:—It has been well known by Pilsbry and Fox that this western shell is not the *Alasmidonta truncata* Wright, mentioned by Simpson. This species is easily recognized by its post inflated shell making the post-dorsal portion almost truncated and also by its extremely coarse beak sculpture. Its very long narrow foot extension is a notable physiological character. It delights in sandy, pebbly situations. The muddy waters of North Missouri is not conducive to its distribution there and is very rare in the Osage basin; however, it is rather a common shell in the Gasconade where it reaches its greatest perfection and is commonly distributed throughout the mountain streams of the south. Occasionally *marginata* is found in the Mississippi north of the Missouri River. The author has records of its breeding season for August through to December, a sufficient record to know that it is a long period breeder (bradytietic.)

SPENCER FULERTON BAIRD

A BIOGRAPHY.

This biography deals with the life of a scientific collector, whose enthusiasm for his work was remarkable. The book contains many letters written by Mr. Baird himself, his brother William, who was also intensely interested in natural history, and by noted men of science who were contemporaries of theirs. The early letters of the two Bairds, while interesting to special students, do not possess the literary charm of more mature minds. Many of the letters of such famous authors as Audubon, Agassiz, Dana, and others are very readable and informing.

Besides these letters, the author, William Healey Dall, A. M. D. Sc., wisely introduced numerous notes by Lucy Hunter Baird, only daughter of the subject of the biography. Miss Baird had contemplated writing her father's life, for which she had gathered much material; but being an invalid, her strength was unequal to the task of composition, and her notes were all she accomplished toward the proposed biography. These notes, however, are the finest part of the life, and make the reader regret that the daughter was unable to do what her heart so desired.

The first four chapters of the biography are entitled respectively, 'Genealogical and Family Notes,' 'Childhood and Youth,' 'Life at Carlisle,' 'The Young Professor.' The first chapter gives a most interesting account of the ancestors of the Bairds, and of noted Americans who were their contemporaries. The three succeeding chapters inform the reader, through numerous letters, of the activities of Mr. Baird up to the time of his appointment as assistant secretary of the Smithsonian Institution. It must be said that hardly anyone but a scientific collector would be interested enough to read all of these letters. But the text of the author, and especially the notes of Lucy Hunter Baird, together with some of the letters, afford a clear insight into the beautiful character of Spencer F. Baird.

The two chapters, 'The Smithsonian Institution' and 'Life in Washington,' are very readable, being made up entirely of the observations of the author and of the notes of Miss Baird. The topics of these chapters are of general interest, dealing either with the growth and development of the Smithsonian or with important personages in Washington, with whom Mr. Baird had

official relations. Incidentally, his noble character is further revealed to the reader, who feels grateful for the opportunity of making the acquaintance of a man of such sterling worth.

The chapters, entitled respectively '1850 to 1865' and '1865 to 1878,' are filled with letters from eminent Americans who were either scientists or government officials. The contents of these letters being mostly of a scientific character, and even that of a special phase of the subject, they will not interest most readers enough to entice them to peruse the entire collection. The topics treated in these letters refer almost exclusively to collections that were being made for the Smithsonian Institution.

A very interesting chapter is that which follows the two mentioned in the last paragraph. Few letters find place in the text, and a more general interest is found in the varied activities of the new secretary of the Smithsonian Institution. Besides the immense work directly or indirectly connected with the Smithsonian, Baird's appointment as head of the U. S. Commission of Fish and Fisheries used up much of his energy from 1871, the year of the establishment of the Commission. Incidentally, much of what he planned and accomplished in this new department is narrated in this chapter.

Another interesting chapter tells the story of the foundation of the U. S. National Museum. Baird had long contemplated the project of a scientific museum that would be a credit to the greatness of the United States, and had for years accumulated material for this purpose. Finally the government gave the money that had been loaned and repaid by the corporation that managed the Centennial Exposition of 1876, toward the erection of a building in 1881, and G. Brown Goode, probably the greatest expert in the country on conducting museums, was put in charge of the new foundation.

The chapter on 'The U. S. Commission of Fish and Fisheries' contains much information of a general character that will be very welcome to any reader, whether he is specially interested in science or not. The nobility of Spencer Baird's soul is clearly evidenced in the disinterestedness with which he entered this new field of labor. He succeeded in getting congress to make his appointment non-remunerative, hoping that in so doing only worthy and competent men would ever be selected for the position of secretary. His success in promoting everything he undertook

in connection with fish and fisheries in the United States was well-nigh phenomenal. Like all the other chapters of this excellent biography, the present one gives us glimpses of a beautiful character, and our only regret in closing the volume is that there is so much in it on science, and not enough about a personality of such singular charm.

The biography fittingly ends with eulogies from public men, personal friends or acquaintances, and co-laborers of Spencer F. Baird. They all without exception speak in terms of great appreciation of the man, "the mere mention of whose name strikes a chord of dear memories in the hearts of all who knew him. No man of our time has left a purer memory, a more stainless name or a more animating and enduring influence over his special field of labor than S. F. Baird. He was loved by those who knew him when he was living; he is revered by those who have survived him. Mr. Baird lived on a higher plane of life and breathed a purer atmosphere than most men. Quiet and unassuming, with a nature as gentle as a child's, his natural superiority never failed to show itself when he was with other men."—*Brother Alphonsus, C. S. C.*

The biography is published by J. Lippincott Company, Philadelphia. Price, \$3.50.

NOTES ON OUR LOCAL PLANTS.—XIII.

BY J. A. NIEUWLAND.

Amelanchier intermedia Spach., Hist. Veg. 2: 85 (1834).

Amelauchier canadensis var. *oblongifolia* T. and G. Fl. M. A. 1:473 (1840).

Liverpool (Umbach), 964 St. Joseph. Common at Webster's north of Notre Dame, growing not far from both the preceding and following.

Amelanchier spicata (Lam.) C. Koch, Dendr. 1: 182 (1869).

Crataegus spicata Lam. Encyc. 1:84 (1783). *Amelanchier stolonifera* Wiegand, Rhodora 14:144 (1912).

Pine (Umbach), Lake Co. (Hill) S. E. of Notre Dame, also N. of Notre Dame at Websters.

ADENORACHIS (DC) Nwd., Am. Mid. Nat. IV., 93 (1915).¹

Aronia Medicus, Phil. Bot., 140 (1789) also Persoon, II., 39 (1807), not *Aronia* Mitchell, Diss. App. 1, (1769) = *Orontium* Linn. nor *Aronia* Athenaeus = *Arisarum* or some *Arum*: nor *Aronia* Dodonaeus and of the older writers (possibly *Crataegus* *Azarolus* Linn. or *C. Oxyacantha* Linn.) Dod., Cruydtboeck, 522, 1176, 1255 (1618).

Adenorachis atropurpurea (Britton) Nwd. l. c.

Aronia atropurpurea Britton, Man. 517 (1901).

St. Joseph Co., Ind.

Adenorachis nigra (Medic.) Nwd.

Adenorachis melanocarpa (Michx.) Nwd. l. c. 94. *Aronia melanocarpa* (Michx.) Britton Ill. Fl. II, 291 (1913). *Mespilus arbutifolia* var. *melanocarpa* Michx., Fl. Bor. Am. I. 292 (1803). *Hahnia arbutifolia* var. β . *nigra* Medic. l. c. p. 82. (1793).

Marshall Co., Porter Co., Lake Co., (Deam).

OXYACANTHA Dioscorides, 1:105.

Crataegus Linn., Syst. (1735), Gen. 143 (1737), 213 (1754), *Mespilus* Tour., Elem. 502 (1694), *Mespilus* or *Crataegus* Tour., I. R. II. 632 or 642 (1700), *Oxyacantha* Lobelius, Caesalpinus, Ruppius, Dodonaeus, Dalechamps, J. Bauhin, Anguillara, *Crataegus* Theophrastus = *Pyrus torminalis*. According to some *Oxyacanthus* is *Berberis vulgaris* Linn. See Hermolaeus Barbarus, Cordus, Tabernaemontanus, Fraas, Bubani, etc.

Oxyacantha Crus galli (Linn.)

Crataegus Crus galli Linn. Sp. Pl., 476 (1753).

10523, 10400 Notre Dame, 520, 7573, Studebaker's Woods, South Bend.

¹ Medicus refers *Mespilus arbutifolia* Linn. (*Aronia arbutifolia* (Linn.) All. to his genus *Hahnia*. (Geschichte der Bot. 82 (1793). Medicus' genus is, however, an impossible aggregate of types containing beside the above, which is mentioned last, such widely different plants as *Pyrus torminalis* *Pyrus Aria*, *Mespilus Chamae-mespilus*, and *Sorbus fennica*! Moreover, the genus is described by him as having, "Ein, zwei bis drei griffel. Die Frucht is ein zwei oder dreifacherichte oben geschlossene fleischhohle etc. Under the caption *Hahnia arbutifolia* he seems to apologize for including this plant in *Hahnia* "Hat gewöhnlich fünf, griffel und fünf lederartige Gefache, in jeden einen bis zwei Saamen." *Aronia arbutifolia* (Linn.) Ell. can in no way be considered as even properly belonging in *Hahnia*, to say nothing of being regarded as its type. Any one then who would so far abuse the application of the theory of residues as to use this name too replace *Aronia* were foolhardy indeed.

Oxyacantha calpodendron (Ehrh.).

Crataegus calpodendron Medic., Gesch. Bot. 83 (1793) *Mespilus calpodendron* Ehrh. Beitr. 2: 67 (1788), *Crataegus tomentosa* Du Roi, Harbk. Baumz. ed. I, 183 (1771) not Linn.

Lake Maxinkuckee (Clarke), Elkhart (Barnes), 2162 Lake Co. 10386 Notre Dame 578½ Laporte Co.

Oxyacantha alnorum (Sarg.).

Crataegus alnorum Sarg. Rhodora, 5:153 (1903).

2003, 13088 Notre Dame, Ind.

Oxyacantha macrosperma (Ashe).

Crataegus macrosperma Ashe, Jr. E. Mitch. Soc., 16: 73 (1900). Porter Co. (Dea).

Oxyacantha rugosa (Ashe).

Crataegus rugosa Ashe, Jr. E. Mitch. Soc. 17: 19 (1902). 461, St. Joseph, Mich.

Oxyacantha Jesupi (Sarg.).

Crataegus Jesupi Sarg. Rhodora 5:61 (1903).

1663, 2161, 10313, 10417. 11155, 10383, 10384, 10530 Notre Dame, Ind., 10312 Studebaker's Woods, South Bend, Ind.

Oxyacantha punctata (Jacq.).

Crataegus punctata, Hort. Vind., 1: 10, pl. 28 (1790).

1678 Notre Dame, Ind., 514, 9146, 10313 Studebaker's Woods, South Bend.

Oxyacantha coccinoides (Ashe).

Crataegus coccinoides Ashe, Jr. E. Mitch. Soc. 16: 74 (1900). 10385, 13103 Notre Dame, Ind.

Oxyacantha coccinea (Linn.).

Crataegus coccinea Linn., Sp. Pl. 476 (1753).

435, 436, 1706, 1818, 2003½, 10338 Notre Dame, Ind., Lake Maxinkuckee (Clarke), St. Joseph (Rothert).

Oxyacantha Brainerdi (Sarg.).

Crataegus Brainerdi Sarg. Rhodora 3: 27 (1901).

2143, 9536, 10376 Notre Dame, Ind.

Family 92. **DRUPACEAE** Linn., Phil. Bot. 31 (1751) and (1754).

Amygdalaceae Reichb. Consp. 177 (1828), Don. Gen. II, 481 (1832), Roemer, Syn. Mon. III, 1, (1847). *Amygdaleae* Juss. Gen., 340 (1789).

PRUNUS Dioscorides, Mat. Med., 137.

Proune Theophr. 4:3, Tour., Elem. 494 (1693). I. R. H.,

632 (1700), Linn., Syst. (1735) *stricto sensu*, Gen. 141, (1737), 213 (1755) in part. *Prunus* of all the older authors.

Prunus americana Marsh, Arb. Am. 111 (1785).

Starke Co. (Deam. 11086 Notre Dame, Ind.

CERASUS Theoph., Hist. 3: 13.

Cerasus of nearly all the older writers. Tour., Elem. 625 (1694) I. R. H., 496 (1700) Linn., Syst. (1735). *Prunus* in part of his later works. Except Gen 141 (1737).

Cerasus pennsylvanica (Linn. f.) Loisel. Arb., 9 (1801-1819).

Prunus pennsylvanica Linn. f. Suppl., 252 (1781).

Clarke, Ind. (Umbach) Porter Co. Deam, 9122 Lakeville, Ind. (Greene).

Cerasus acida Brunfels, Herb. Viv. Ic. (1531-2).

Cerasus sativa Tragus, Hist. 1026 (1552), *Cerasus vulgaris* Tragus, *C. austera* Cordus Hist. Annot. 23 (1561), *Cerasus macedonica* Pliny?

10515 St. Joseph, Mich. (Escaped.)

Cerasus glauca Moench, Meth. 672 (1794).

Cerasus pumila Michx., Fl. Bor. Am. II., 286. (1803) not *C. pumila* Botck. (1797). = *C. Chamacerasus*.

18045 Porter Co. (eDam.) Lake Co. (Deam) (Coulter), Porter Co. (Cowles) Pine and Clarke, Ind. (Umbach). 2629 Millers, Ind., 467, 447, 3339, 3359, St. Joseph, Mich. 712 Sagunay, Laporte Co., 11754. Webster's Crossing, St. Joseph Co. This plant is mostly shrubby, 6 feet tall and upright. Common in the dune region of Lake Michigan.

PADUS Theophrastus, Hist., 4: 1.

Also *Padus Cusa*, C. Bauhin etc. *Padus* Linn. Syst. (1735). Gen. 142 (1737), Miller, Gard. Dict. Abr. ed. 4, (1754).

Padus nana (Du Roi) Roemer, Arch. 1, 2: 38 (1797).

Prunus nana Du Roi, Harbk. Baumz., 1, 2: 194 (1772). *Prunus virginiana* of Am. authors not Linn.

Lake Co. (Deam) Porter, Laporte, (Deam), Lake Maxinkuckee (H. W. Clarke), 3736 Notre Dame (Powers), 2015, 10512 Notre Dame.

Padus virginiana (Linn.) Miller. Gard. Dict. ed. 8. No. 3 (1768).

Prunus virginiana Linn. Sp. Pl. 473 (1753), *Prunus serotina* Ehrh. Beitr. 3: 20 (1788).

Marshall, Porter Co. (Deam). Lake Maxinkuckee (H. W.,

Clarke), Clarke, Ind. (Umbach), 9265, 10516 Notre Dame, 7755 St. Joseph, Mich.

PERSICA (Pliny, Theophr.) Tabernaemontanus, Auguillara Lacuna, Gerard, Camerarius, Tragus, Fuchs, Hist, 205a (1549). *Persicus* Palladius, *Persicum* T. Gaza. 1529 *Malum persicum* Pliny, 13: 19. *Persica* Tour. Elem. 496 (1694), I. R. H., 624 (1700). *Persica* Duham. Arb., II, 105. (1755).

(T be continued.)

UNIONIDAE WITH ABNORMAL TEETH.

BY SAM. W. GEISER.

The following brief list, notes, and partial bibliography, is given as a contribution to the scanty literature dealing with this phase of molluscan life and teratology.

In the years 1908-1911, the writer collected a considerable amount of molluscan study-material, from the various rivers of the northeastern part of the state of Iowa, particularly in Buchanan, Fayette, Clayton, Allamakee, and Winneshiek Counties. In the summer of 1913, the waters of a number of other rivers in Iowa were examined.

It is surprising to find how large a percentage, *relatively*, of the mollusks of this group are either abnormal, or in some way diseased, *in certain restricted localities*, while one may go over, carefully, a large number of shells from other stations, without finding any teratologic specimens. All but one of the specimens noted came from the Wapsipinicon river near Independence, Iowa. Briefly listed, they are:

SHELL WITH ONE PSEUDOLATERAL IN EACH VALVE:

Lampsilis luteola, ♂, 4 years old, ♀, 5 years old.

Lampsilis ventricosa, ♀, 6 years; w. 3 pseudocardinals in right valve, sex? 2 yrs.¹

LATERALS OF BOTH VALVES FLATTENED:

Lampsilis ventricosa, ♂, 12-15 yrs. (Cardinals gone by dental caries.)

NO PSEUDOCARDINALS IN RIGHT VALVE:

Lampsilis luteola, ♂, 6 yrs.

¹ See in this connection THIS JOURNAL, Vol. II, pp. 65-67, 1911.

THREE PSEUDOCARDINALS IN RIGHT VALVE:

Lampsilis ventricosa, ♀, 6 yrs., (1 lateral in left valve); ♀
10-12 yrs.

Lampsilis luteola ♂, 6 yrs.

A study of the frequency of occurrence of diseased and abnormal freshwater mussels seems to indicate:

That certain weak-toothed genera, like *Symphynota* and *Alasmodonta* have very rarely abnormalities of any kind.

That, in the order of frequency of occurrence, the Anodontoid genera and *Lampsilis ventricosa* and *Lampsilis luteola*, are commonly affected by trematode parasites, which disfigure the shells internally.

That the presence of garbage, especially sewage, in the water apparently conduces to the well-being of these parasites, while anodontoid shells from clear ponds are in very many cases entirely free, as a community, from these parasites.

In certain of the most common and widely distributed genera and species, especially *L. luteola* and *L. ventricosa*, the teeth are often defective through what has been called "dental caries," in which the horny material of the ligament and periostracum has replaced the shelly substance of the hingearea.

Quadrula, *Pleurobema*, and similar genera with heavy shell and teeth, are, as a rule, generally normal.

AN ANNOTATED PARTIAL BIBLIOGRAPHY, ARRANGED CHRONOLOGICALLY, OF PAPERS ON THE SUBJECT.

LEA, ISAAC. *Description of a New Genus of Naiades*. Tr. Am. Phil. Soc., 1829, III: 403-457, 8 plates. [1830]. At page 428, pl. viii, fig. 11, is described *Unio heterodon* (= *Alasmodonta heterodon* (Lea) Simpson,) from the Schuylkill. The species is very variable, as the laterals in each valve may be single, double or triple.

CONRAD, TIMOTHY A. *Descriptions of New Fresh-Water and Marine Shells*. Jl. Acad. Nat. Sci. Phila., 1850, pp. 275-278, 2 plates. At p. 276, pl. xxxvii, fig. 7, may be found description of *Unio contrarius* (= *Lampsilis contraria* (Conr.) Simpson). The locality. (Ogeechee River, Georgia,) Simpson considers doubtful, and opines that this species may be simply a small male specimen with reversed laterals.

AGASSIZ, LOUIS [Communication on Abnormal Shells] Proc.

Boston Soc. Nat. Hist. VII: 166-167, [1859]. He exhibited a reversed *L. ligamentina*.

LEA, ISAAC. [*Communication on Reversed Unios*]. Proc. Acad. Nat. Sci. Phila., 1860, pp. 51-53. A very interesting paper—worth attention. A list is given of the teratologic specimens in Dr. Lea's cabinet.

KEYES, CHARLES R. *An Annotated Catalogue of the Mollusca of Iowa*. Bull. Essex Inst., XX: 61-83, (1889). Notes the collection of a number of specimens, but gives no records.

SIMPSON, CHARLES T. *The Classification and the Geographical Distribution of the Pearly Fresh-Water Mussels*. Proc. U. S. Nat. Mus., XVIII: 295-843, w. pl. ix. Observations on margaritanoid genera, (p. 303), *Margaritana monodonta*, (p. 304), *Dalliaella purpurea*, (pp. 304-305), and *Symphynota compressa*, as well as others, are interesting, in this paper. SIMPSON's *Synopsis of the Naiades, or Pearly Fresh-Water Mussels*, (Proc. U. S. Nat. Mus., XXII: 501-1044, (1900)), contains also many scattered notes on dental variation.

A paper by the present writer, already referred to in footnote. [1911].

Department of Biology, Guilford College.

RECORDS OF ADVENTIVE PLANTS.

Among the plants which as far as I have been able to find have not as yet been recorded from our region the following may be of interest. *Conringia orientalis* (Linn.) Dumort., was found along the Michigan Central R. R. at Notre Dame. Quite a number of plants were seen so that it may be considered as part of our flora. Rather more important would appear to be the presence of *Grindelia squarrosa* (Pursh) Dunal. It was found in an alfalfa patch about one mile from Hudson Lake in Laporte County. A considerable number of plants were apparently well established. The most eastern record according to the manuals is Illinois, but it seems to be working its way eastward, being probably introduced with alfalfa seed. *Matricaria matricarioides* (Less.) Porter (*Matricaria discoidea* DC.) has been established at Notre Dame for many years along walks and on the campus where it reappears annually. It is native of the Pacific coast.—J. A. N.

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that of the Prairie States

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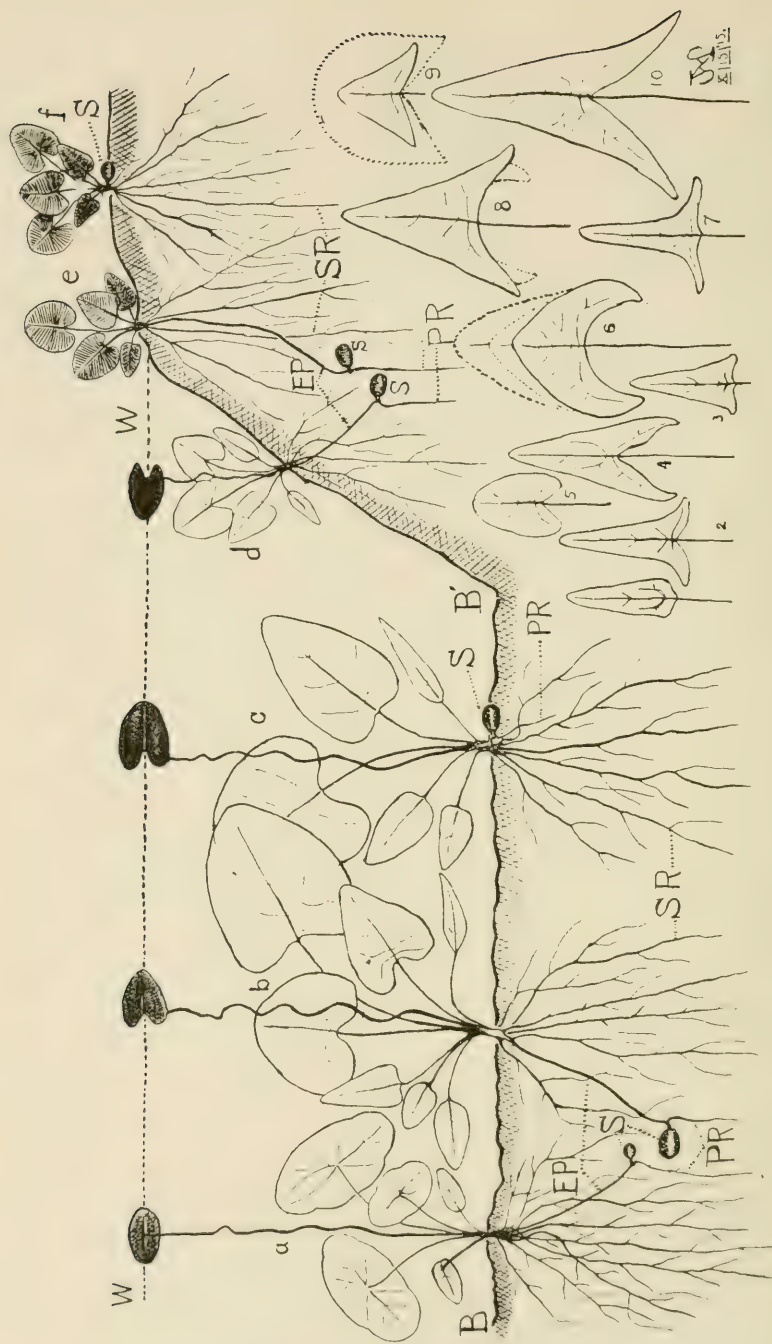


PLATE XIV.

NIEUWLAND ON HABITS OF WATERLILY SEEDLINGS

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HABITS OF WATERLILY SEEDLINGS.

BY J. A. NIEUWLAND.

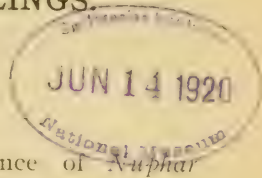
[Plate XIV]

During several weeks study of an abundance of *Nuphar* and *Brasenia* material at Bankson Lake, Van Buren Co., Mich., in the late summer of 1914 and 1915 some interesting details of the habit of seedlings of these plants were obtained. The plants by their great number and peculiar response to the various environments to which they were subject, appeared particularly in congenial conditions for study of variations in development.

Noteworthy additions to our knowledge of *Nymphaea* seedlings as to habit and method of germination were brought out by Conard¹ in his Monograph on these plants. Seedlings of *Nymphaea tuberosa* Paine, [*Castalia tuberosa* (Paine) Greene] at Bankson Lake showed conditions of growth and response to surroundings as were outlined by Conard, and the members of the white waterlily group having been so thoroughly treated by that author only a few notes need here be added regarding leaf variation of the seedling of this plant. Sprouting tubers of the various members of the *Nymphaea* group such as *N. gigantea*, *N. mexicana*, *N. flavovirens*, *N. flava*, *N. elegans*, *N. canzibarensis* var. *rosea* and a hybrid have their leaves shown on p. 75 bringing out a remarkable variety of these submersed members.

These plants have two very distinctly different kinds of leaves. The submersed aquatic, depending upon their age or succession of development and the depth in the water, show a tendency to enlarge and become broader. Smaller forms are found in shallow water where the penetration of light rays is

¹ Conard, H. S. The Waterlilies, a Monograph of the Genus *Nymphaea* Carn. Inst. Wash. (1905).



not cut out by silt and side refraction of the medium. These submerged leaves are, moreover, very thin, and when dried even filmy and easily broken and blown away by the slightest gust of air. Histologically the cells are more alike and more spherical or ovoid in shape. Their vascular tissue is reduced to a minimum since scarcely necessary, except the phloem part. The floating leaves are produced later and at any one time are fewer and smaller, quite thick, in fact miniatures in every way of those of the mature plant. Usually not more than two or three are found on one plantlet and oftener, but one in small specimens. Conard does not emphasize, as might be done, the variation of shape of the successive seedling leaves. As already referred to he selects aquatic leaves from the sprouting tubers rather than from seedlings, and whatever leaf variation in stages are taken up (p. 110) are at random picked from different species not serially shown as to age or successive appearance.

Examination of hundreds of seedlings of different ages of *Nymphala tuberosa* showed us that the different leaf forms of this one species vary as much if not more than of the tuberous growths. Such a series of aquatic leaf variations have been selected as typical from the so-called "coves" of Bankson Lake, and the originals kept in the University herbarium, and illustrated in figures 1-10 plate XIV. The dotted outlines indicate other forms from the type connected with them. The order of appearance in the growing seedling varies as the breadth of the leaf and the size of the basal lobe, the very earliest devoid of blade, the earlier narrow and quite devoid of lobes. The second leaf is usually narrowly lanceolate or linear (Fig. 1). A curious fact is the presence even on the same plantlet of sharp angular sinus at the insertion of the petiole (4, 5, 9, 10,) and rounded or even obtuse protrusion at place of insertion in these submerged seedling leaves. Fig. 5 represents that might well be taken for a specimen of the *Nuphar* group, but for the fact that other leaves on the same plant are unequivocally those of *Nymphaea*, and the adhering seed coat could not be mistaken. The seeds of *Nuphar* are large and shiny, those of *Nymphaea* small and black, those of *Brasenia* small and grayish white, both of the latter dull. The method of germination of *Nymphaea* seedlings were found to be the same as outlined by Conard.²

² l. c. p. 107:112.

BRASENIA SCHREBERI.

Seedlings of *Brasenia* in great numbers were studied and found to have the same mode of germination as those of *Nymphaea*. [Plate XIVa.] The following variations due to environment were observed. Seeds [S] embedded in mud often as much as four to six inches break open by protrusion of the cotyledon petioles carrying out the axil, from which the epicotyl arises as a long thread-like growth. The more or less delayed primary root passes downward [PR]. The epicotyl [EP] when reaching the surface of the mud or bottom of the pond, expands and produces a cluster of leaves of varying size but with the exception of the first few, of about the same shape. The cotyledons are permanently intraseminal and seem to serve no purpose except to suffer the transfer of food collected in them, to the seedling especially to the primary root and epicotyl until it has produced leaves. While so doing the cotyledons gradually wither away. All the submerged leaves are thin, and filmy when dried, and histologically nearly as in *Nymphaea*. The first blade-bearing leaf is narrowly oblong and the petiole is *not peltately inserted, but at the margin of one end*. The subsequent leaves are excentrically peltate the earlier ones just slightly intra-marginally inserted. The size of the leaves beneath the water depends on the depth of submersion, the plants in deep water bearing very large ones. After about 6-9 of these thin aquatic leaves have appeared, there arises a single smaller perfectly elliptical floating one [W] which is thick in texture and except for the absence of slimy exudation on the lower face characteristic of mature floating foliage and petiole, is quite a miniature of the older leaves. The stalk is very long, whereas the petioles of leaves of older plants are short, and the whole plant, stem and leaf cluster of maturer specimens arise to the surface of the water. The plants continue a succession of these long stalked floating leaves until a stem rises from the rooting plantlet, when the newly developed foliage begins to produce the slimy covering of the young immersed parts. *Brasenia* seeds not embedded in mud at the bottom, germinate without growing an elongated epicotyl, the seedling appearing to come almost directly from the axils of the cotyledons. It is not likely that seeds of this plant or *Nymphaea* would develop on or in mud above the water line. Such specimens could not be

found as was the case with *Nuphar*, giving rise thus to a new response to a new environment in the last named plant.

NUPHAR ADVENA.

Two distinct species of Yellow Pondlilies were found in Bankson and North Bankson Lakes. Both are abundant in sheltered muddy parts of the lakes called "coves." So readily were they distinguished at sight that my attention to the main differences was first called by a companion who had never studied botany. *Nuphar advena* grows nearer to shore as a rule but even in very deep location lifts its leaves entirely out of water. *Nuphar variegata* grows nearly always in deep places and the leaves always float. The petioles of the former are stout oval or almost orbicular in cross section and the basal sinus is open with wide spreading lobes. The lobes of the later are closed and the semicircular outline of petiole cross section shows two noticeable projections representing wings.

Fernald and St. John¹ consider Standley's estimate as to the size of the "floating leaves usually 17-28 cm. long and 11-22 cm. wide" "as unfortunate" or apparently extravagant. From herbarium specimens it is not always safe to conclude as to leaf-size, even if such a character means very much in some plants. There is a decided tendency not to collect the older and the largest leaves of plants, because they are in case of water plants especially, inconvenient to mount, or defective or broken by wind and eaten by insects. My herbarium specimens of these plants were very carefully made in the last few years, yet not with the idea of obtaining the largest sizes, though the largest young and perfect ones. Average sizes were obtained and their length is from 15-30 cm., and they are proportionately wide. I have seen numerous plants with older but torn leaves that were no less than 35 cm. long!

The rhizomes of both species of *Nuphar* can not be distinguished. The specimens of skins of those of *N. variegata* show perhaps closer arrangement of leaf insertions in phyllotaxy, and are found deeper in the mud, the roots usually arising only from the lower side in both. I have been unable to find aquatic foliage in blooming plants late in season, though in vegetative specimens of *N. variegata* such was occasionally met with. The flowers of

¹ Rhodora 16: 138 (1914)

the latter are notably larger and darker red and the stamens much more numerous. The crenate margined stigma has the lines in flower running to the edge, whereas in *N. advena* these do not reach the margin by one third or one fourth their length. The fruits of the last mentioned are deeply cratered and scarcely narrowed abruptly at the top. Whereas the fruits of the yellow pond lilies ripen above water or bend down eventually, the fertilized flowers of *Nymphaea tuberosa* are pulled down close to the bottom as the peduncle twists into a close spiral after the manner of *Valisneria* pistillate-flowered peduncles.

It was found impracticable to study seedlings of *N. variegata* because the plant always grew where *N. advena* was also found. There were, however, many places where the latter was exclusively to be found so that the seedlings obtained are with certainty those of the latter. Moreover, the plantlets of *N. variegata* which were indisputably such, were already too far advanced to show results, and too few to be worth while.

The seedling of *N. advena* exhibits more differentiation in response to environment than any of the other water lilies. Like those of *Brasenia* and *Nymphaea*, seeds of *Nuphar* buried in mud either at the bottom of the pond [b.e.] or above the water line [f] send out an elongated epicotyl with the primary root. On emerging from the darkness in the mud, aquatic leaves are produced which are thin and evanescent, their size varying as the depth of water or consequent absence of strong light. The first blade-bearing leaf is narrowly lanceolate to linear and the succeeding ones become broader and more orbicular and finally cordate obtuse at the apex or rounded, with reniform base, and with more or less rounded basal lobes. When found in deep water the submerged leaves are in texture and size like those of *Nymphaea tuberosa*, but of a yellowish green color. Leaves of plantlets of the same age in shallow clear water [d] are darker green and smaller. Seeds of the plant [c] not embedded in the mud of the bottom do not produce the characteristic elongated epicotyl. All *Nuphar* seedlings produce after the usual set of submerged leaves, one or two thick smaller floating leaves, as in *Brasenia* and *Nymphaea*. These are approximately miniatures as to shape and structure of mature leaves, but as they always float, they have no stomata on the lower face. An interesting characteristic of seedlings of *N. advena* not found in the others, *Nymphaeaceae*

not even in case of *Nuphar variegata*, is that the seeds germinate above the water line in or on mud. In this case no aquatic foliage whatever is produced [e.f.]. The leaves are the usual thick aerial ones with short stout petioles. They are even firmer and proportionately smaller than the floating ones. Even when not germinating below the water line, but when embedded in mud the seeds send out the elongated epicotyl [f.]. *N. advena* alone seems to have this last environment. The variation of shape in these aerial leaves is also a gradual one, the very earliest, however, are never as narrow as the younger aquatic ones. In fact should the water of a pond lower and leave plantlets with one or two aquatic thin leaves exposed to air, no more aquatic foliage is produced, but only aerial thicker leaves. Such changes from water exposure to air exposure of foliage and back again are rapid and frequent, due to the fact that the rise and fall of the so-called "floating islands" or musk-rat feeding-places occur. These animals undermine large patches of root-entangled bottom which rises and small islands float about. As the other plants on them die these patches often sink again. Around the muskrat "runs" these "floating islands" dip abruptly into deep water, and all the stages of *Nuphar* seedling environment may be found within the area of single square yard.

North Bankson Lake is muddier than the other lake as it has in very recent times been cut off by a sand-bar raised by wind and wave action. It is now much more sheltered and has rather large areas of these "floating islands" which have become a tangled mass of roots of *Carices*, *Cyperis*, *Scirpi*, *Junci*, *Eriophorum* and principally *Rhychospora macrostachya*, *Dulichium arundinaceum*, *Hemicarpha micrantha*, *Fuirena squarrosa*, one or two species of *Fimbristylis* and *Eleocharis*, many tall grasses *Nyris flexuosa*, *Peltandra virginica*, *Sparganium minimum*, *Eriocaulon septangulare*, and nearer the water line, *Utricularia intermedia* and *minor* growing with *Nuphar advena* seedlings. It is very unsafe to venture upon these patches without the aid of planks as they are real floating quagmires. Changes in environment to meet rapidly varying conditions are so frequent that the *Nuphar* seedlings accommodate themselves apparently to all the habitats in rapid succession. I have even found *Nuphar advena* seeds germinating in the almost dry drained bottom of a pond south of South Bend, where the older plants deprived of sufficient moisture were rapidly drying off.

PLATE XIV.

EXPLANATION OF FIGURES.

FIG. a. *Brasenia Schreberi* Gmel. Seedling illustrating habit of growth with thin aquatic submersed foliage and one quick floating leaf (W) when the seed germinates below the muddy bottom (BB¹). Ep Elongated epicotyl. (S), Seed, (PR), Primary root. (W) Thick aerial leaf. The other habitats are similar to the following of Figs. (b), (c), and (d).

FIG. b. *Nuphar advena* (Soland) R. Br. Seedling showing aquatic and floating leaves, and habit of the preceding. Parts labelled as in Fig. a.

FIG. c. Same with seed germinating at the bottom on the mud but not buried. No elongated epicotyl developed.

FIG. d. Same showing diminution in size of aquatic foliage when growing in shallow water with stronger light.

FIG. e. Same with aerial thick foliage when growing in mud above the water line (WW¹).

FIG. f. Same the seed germinating upon instead of below mud. Foliage as in the preceding (Fig. e); no aquatic leaves developed.

FIGS. 1-10. Variations in aquatic leaf shapes of seedlings of *Nymphaea tuberosa* Paine. The older leaves are broader with larger basal lobes.

All plants about $\frac{1}{2}$ to $\frac{1}{4}$ natural size. Drawing diagrammatic, the petioles of all naturally longer, particularly in case of floating foliage. Petioles of the air-exposed plants (Figs. e and f.) drawn in natural proportions. All plants drawn from herbarium specimens collected at Bankson and North Bankson Lakes in August, 1915.

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—IV.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—IV.

With Notes by J. Lunell.

Sub-class 2. DICOTYLEDONEAE.

D. C. Syst. I., (1818), also Prodr. I., p. 1. (1814).

Order 16. SALICINAE.

Bartling, Ord. Nat. Pl. p. 118. (1830.)

Family 29. SALICINEAE L. Rich ex A. Rich. Nov. Fl. Bot. ed. 4, p. 560. (1828), also Lindley, Nat. Syst. ed. 2, p. 186. (1836).

POPULUS Virgilius Ecl. IX. 41, Plinius XXIV, 8, Horatius, Carm. 11. 3.

302. *Populus tremuloides* Michx. Fl. Bor. Am. 2. 243. (1803).

No trees surpass or equal this in the tendency of forming natural groves whenever it has the slightest opportunity. No other tree seeds itself on the open prairie.

Leeds, Butte, Dunsieith; Kulm (Brenckle).

*AIGEIRO*s Homeros, Odys. VII: 106, XVII: 208. Hesiodus, Scut. Herc. 377. Theophr. III: 14. Diosc. I: 144.

303. *Aigeiros deltoides* (Batr.) Tidestrom, Elysium Marianum II, p. 16. (1910).

Populus deltoides Batr.: Marsh, Arb. Am. p. 106. (1785).

Everywhere in cultivation, and, when indigenous, growing in such protected places as railroad ditches, ravines, etc. Leeds.

304. *Aigeiros Sargentii*.

Populus Sargentii.

A tree "easily recognized by the pubescent winter-buds and by the light yellow color of the branchlets." It ought to grow "especially in the western part of the state." (The citations are from a letter by Prof. C. S. Sargent.)

305. *Aigeiros balsamifera* (Linn.) Lunell.

Populus balsamifera Linn. Sp. Pl. 1034. (1753).

An indigenous tree. Turtle Mountains.

306. *Aigeiros candicans* (Ait.) Nwd. in Am. Midl. Nat. Vol. III, p. 223. (1914).

Populus candicans Ait. Hort. Kew. 3. p. 406. (1789).

Escaped from cultivation. Leeds.

SALIX Virgilius Ecl. II: 83, V: 16, X: 140, Georg. IV: 184, Culex 54. Plinius. Nat. Hist. XXI: 20.

307. *Salix vitellina* Plinius XVI: 37. Linn. Sp. Pl. ed. 2, 1442. (1763).

Cultivated like the following and often escaping. Leeds.

308. *Salix vitellina aurea*.

A variety widely used for hedges. Leeds.

309. *Salix amygdaloides* Anders Ofv. Sv. Vet. Akad. Förhandl. 15:114. (1858.)

Leeds, Minnewaukan.

310. *Salix lucida* Muhl. Neue Schrift. Ges. Nat. Fr. Berlin 4:239, p. 6, f. 7. (1803).

In the Willow Creek ravine near Dunsieith.

311. *Salix interior* Rowlee, Bull. Torr. Bot. Club, 27, p. 253. (1900).

Salix longifolia Muhl. l. c. 238. (1803), not Lam. (1778).

The most common willow in the state. Leeds, York.

312. *Salix linearifolia* Rydb. in Britt. Man. 316. (1901).

Sand hills near Willow City (Bottineau Co.).

313. *Salix bebbiana* Sargent, Gard. and For. 8:463. (1895).

Salix rostrata Richards. Frank. Journ. App. 753. (1823).

Not Thuill. (1799).

One form coming very near to *S. perrostrata* Rydb. was found by the writer in Benson Co. 1906, and deposited in the Herbarium of Harvard University.

Leeds, Butte.

314. *Salix humilis* Marsh. Arb. Am. 140. (1785).

Butte.

315. *Salix discolor* Muhl. l. c. 234, pl. 6, f. 1. (1803).

Butte.

316. *Salix petiolaris* J. E. Smith, Trans. Linn. Soc. 6, p. 122 (1803.)

Butte.

317. *Salix candidula* Nwd. in Am. Midl. Nat. Vol. III. p 225. (1914).

Salix candida Fluegge in Willd. Sp. Pl. 4, p. 708. (1806), not Plinius l. c. = *Salix vitellina*.

In boggy ravine, Butte. In deep gravel near Willow City, (Bottineau Co.).

318. *Salix candidula* x *petiolaris*.

Only one shrub in boggy ravine, Butte.

319. *Salix chlorophylla* Anderss. Ofv. Sv. Vet., Akad. Förhandl. Stockh. 6. 138. (1867).

Kulm (La Moure Co.). Perhaps my identification is incorrect.

320. *Salix cordata* Muhl. l. c. p. 236. p. 6, fl. 3. (1803).

Leeds, Butte, Peninsula of Lake Ibsen, Bismarck.

Order 17. AMENTACEAE.

(Ray, Boerhave) Gmelin, Fl. Sibir. 1: 150. (1747); Juss. Gen. 407. (1789); Bartling, Ord. Nat. Pl. 96. (1830).

Family 30. CORYLACEAE Mirbell ex S. F. Gray, Nat. Arr. Br. Pl. II. p. 244. (1821), in part.

OSTRYA Plinius XIII: 21.

321. *Ostrya virginiana* (Mill.) Willd. Sp. Pl. 4:469. (1805)

Carpinus virginiana P. Miller, Gard. Dict. ed. 8. (1768).

Fargo, (Lee, O. A. Stevens).

CORYLUS Virgilius Ecl. I: 14, II: 3; Georg. II: 69 and 209, Plinius XVI: 18, Caesalpinus De Plantis 38. (1588). Tour. Els. 453. (1694). Linn. Syst. (1735).

322. *Corylus americana* Walter, Fl. Car. 236. (1788).
Turtle Mountains in Bottineau Co.

323. *Corylus rostrata* Ait. Hort. Kew 3:364. (1789).
Turtle Mountains: Dunsieith, St. John.

Family 31. **BETULACEAE** Agardh, Aphor. 208. (1825),
also Bartling, Ord. Nat. Pl. p. 99. (1830).

BETULLA Plinius XVI: 30.

Betula Tragus. Matthioli, Dodonaëus, etc.

324. *Betulla papyrifera* Marsh. Arb. Am. 19. (1785), (cor.).
Turtle Mountains: Dunsieith.

325. *Betulla papyrifera cordifolia* Fernald, (cor.).
Pleasant Lake, Turtle Mountains.

ALNUS Plinius XVI: 24. Brunfels, Tragus, Tour. Els. 459. (1694), Duhamel, Arb. et Arbustes 41. (1755).

326. *Alnus incana* C. Bauhin ex. J. Bauhin, Hist. 6, p. 157. (1650).

Neche (H. L. Bolley).

Family 32. **GLANDIFERAE** Theodore Gaza, De Hist. et Causis Plantar. (1529), also Caesalpinus De Plantis p. 31. (1583).

QUERCUS (Lucretius), Virgilius, Ecl. I: 17, IV: 30, VI: 13, Georg. I: 349, II: 16, III: 332, Culex, 132, Tour. Els. p. 454. (1694).

327. *Quercus macrocarpa* Michx. Hist. Chen. Am. 2:23 (1801).

Minot, Pleasant Lake, Turtle Mountains.

328. *Quercus macrocarpa depressa* Engelm.
Dunsieith.

Order 18. URTICALES.

Engl. Syllab. ed. I. p. 95. (1892).

Family 33. **ULMACEAE** Mirbel, Êl. II:905. (1815).

ULMUS Virgilius. Ecl. II: 70, V: 3, Georg. I: 170, II: 18, 72 222, IV: 144. Tour. Els. p. 473. (1694).

329. *Ulmus americana* Linn. Sp. Pl. 226. (1753).
Towner, Turtle Mountains. In cultivation at Leeds.

CELTIS Plinius XIII: 17. Tour. Els. p. 485. (1694).

330. *Celtis crassifolia* Lam. Encycl. 4, 6, 138. (1797)
Peninsula of Lake Ibsen; Logan Co. (Brenckle).

Family 34. **CANNABINACEAE** Lindl. Veg. Kingd. 265. (1846).

LUPULUS J. de Manliis ex Brunfels Herb. Viv. Ic. 2: 169. (App.) (1531); Tour. Éls. p. 427. (1694.)

331. *Lupulus salictarius* Dodonaeus. Trium Prior. Stirp. Hist. p. 386. (1553).

Humulus Lupulus Linn. Sp. Pl. 1028. (1753).

Turtle Mountains, Pleasant Lake, Towner, Minot.

CANNABIS Dioscorides III: 157, Plinius XIX: 4, 9, XXI: 23. Tour. Éls. p. 427. (1694).

332. *Cannabis sativa* (Dioscorides) Marcellus Virgilius Comment. Diosc. p. 453. (1529).

Richland Co. (W. B. Bell.)

Family 35. **URTICEAE** Ventenat. Tabl. Reg. Veg. 524. (1794).

URTICA Plinius XXII: 13; Tour. Éls. p. 426. (1694).

333. *Urtica gracilis* Ait. Hort. Kew. 3: 341. (1789).

Leeds, Towner.

334. *Urtica Lyallii* S. Wats. Proc. Am. Acad. X. 348. (1875). Pleasant Lake.

LAPORTEA Gaudich, Freyc. Voy. Bot. 498. (1826).

Urticastrum Moehring, Hort. Prov. (1736), also Fabricius, Enum 204. (1759). Undesirable name because built on *Urtica*.

335. *Laportea divaricata* (Linn.) Lunell.

Urtica divaricata Linn. Sp. Pl. 985. (1753). *Urtica canadensis* Linn. l. c. *Laportea canadensis* (Linn.) Gaudich. l. c. *Urticastrum divaricatum* (Linn.) Kuntze, Rev. Gen. Pl. 635. (1891),

Towner on the banks of Mouse River.

ADICEA Raf. Ann. Nat. 179. (1815).

336. *Adicea fontana* Lunell, Am. Midl. Nat. Vol. III., p. 7. (1913).

Pleasant Lake.

337. *Adicea opaca* Lunell, Am. Midl. Nat., Vol. III., p. 8. (1913.)

Pleasant Lake.

HELXINE Dioscorides IV: 86.

Parietaria Brunfels, 2. (1531); Tour. Éls. 409. (1694).

338. *Helxine pennsylvanica* (Muhl.) Nwd. in Am. Midl Nat. Vol. III. p. 235. (1914).

Parietaria pennsylvanica Muhl. Willd. Sp. Pl. 4. p. 155. (1806)

Williston (O. A. Stevens); Wahpeton; Morton Co

Order. 19. SANTALALES.

Engler, Syllab. ed. I. p. 98. (1892).

Family 36. **SANTALACEAE** R. Br. Prodr. p. 350. (1810).

COMANDRA Nuttall, Gen. I: 157. (1818).

339. **Comandra pallida** A. DC. Prodr. 14:636 (1857).

Leeds, Butte.

Order 20. FAGOPYRINAE.

Bartling, Ord. Nat., p. 106. (1830).

Family 37. **POLYGONEAE** Juss. Gen. p. 22. (1787).

ERIOGONUM Michx. Fl. Bor. Am. I: 246. (1803).

340. **Eriogonum annuum** Nutt. Trans. Am. Phil. Soc. (II.), 5:164. (1833-37).

Pretty Rock (W. B. Bell).

341. **Eriogonum multiceps** Nees, Max. Reise N. A. 2:446. (1841).

Morton County (W. B. Bell).

342. **Eriogonum crassifolium** Benth. Trans. Soc. Linn. 17:408 (1837).

Dunsieth, Minot.

RUMEX Virgilius, Mov. 72: Plinius XIX: 12,60.

343. **Rumex Acetosella** Linn. Sp. Pl. 338. (1753).

Willow City, (Bottineau Co.).

LAPATHUM Theophrastus I: 9, 7: 2. Dioscorides II: 140, Gesner. Anguillara, etc. Tour. Els. p. 404. (1694).

344. **Lapathum venosum** (Pursh) Lunell.

Rumex venosus Pursh, Fl. Am. Sept. 733. (1814).

345. **Lapathum mexicanum** (Meisn.) Nwd., Am. Midl. Nat. Vol. III., p. 237. (1914).

Rumex mexicanus Meisner, DC. Prod. 14: 45. (1856).

Rumex salicifolius Hooker, Fl. Bor. Am. 2: 129. (1840).

Not. Weinm. (1821).

Leeds, Butte.

346. **Lapathum occidentale** (S. Wats.) Lunell.

Rumex occidentalis S. Wats. Proc. Am. Acad. 12:253. (1876).

Peninsula of Lake Ibsen, Butte.

347. **Lapathum crispum** (Linn.) Scopoli, Fl. Car. ed. 2:261. (1772).

Rumex crispus Linn. Pl. 335. (1753)

Leeds.

348. *Lapathum persicarioides* (Linn.) Moench, Meth., 355 (1794).

Rumex persicarioides Linn. Sp. Pl. 335. (1753).

Peninsula of Lake Ibsen, Butte.

FAGOPYRUM Lobelius (Obs. 513. (1576). Dodonaeus, Pempt. 4:1: 32. (1583). Tour. Els. p. 411. (1694). Gaertner (1791).

349. *Fagopyrum vulgare* Hill. Br. Herb. 486. (1756).

Fagopyrum esculentum Moench. Meth. p. 290. (1794).

Leeds.

350. *Fagopyrum tataricum* (Linn.) Gaertn. Fr. et. Sem. 2:182, pl. 189, f. 6. (1791).

Polygonum tataricum Linn. Sp. Pl. 364. (1753).

Leeds, (extinct).

RHEUM Linn.

351. *Rheum Rhaponticum* Linn. Sp. Pl. 531. (1753).

Ecsaped. Devils Lake.

PERSICARIA J. de Manliis ex Brunfels Herb. Viv. Ic. II: 173. (1531). Tour. Els. Bot. 410. (1694).

Section *POTAMOCALLIS* Nwd. A. Midl. Nat. II: 216. (1912)

352. *Persicaria rigidula* (Sheldon) Greene in Leaflets, Vol. I, p. 24 and 29. (1904).

Presenting four phases: (a) aquatic, extremely rare; (b) semi-aquatic; (c) riparian; and (d) terrestrial, which is sterile.

Leeds, Butte.

353. *Persicaria ammophila* Greene, l. c., p. 471, and Am. Midl. Nat. Vol. II., p. 236. (1912).

Fargo (Cl. Waldron).

354. *Persicaria* sp. (terrestrial phase), Thorne (Rolette Co.).

355. *Persicaria Hartwrightii* (A. Gray) Greene in Leaflets l. c. p. 24. (1904), and in Am. Mid. Nat. II. p. 15. (1911). Riparian phase. Pleasant Lake

Section *EUPERSICARIA*.

356. *Persicaria lapathifolia* (Linn.) S. F. Gray, Nat. Arr. II, p. 270. (1821).

Polygonum lapathifolium Linn. Sp. Pl. 360. (1753).

Leeds.

357. *Persicaria lapathifolia nodosa* (Pers.) Lunell.

Polygonum lapathifolium nodosum (Pers.) Small, Mem. Torr. Bot. Club 5: 140. (1894).

Polygonum nodosum Pers. Syn. I: 440. (1805).

Kulm (Brenckle).

358. *Persicaria pennsylvanica* (Linn.) Small, Fl. S. E. U. S. p. 377. (1903).

Polygonum pennsylvanicum Linn. Sp. Pl. 362. (1753).

Fargo (O. A. Stevens).

359. *Persicaria maculata* Ehrhicius Cordus, Botanologicon. (1551).

Persicaria maculosa Trew. Herb. Blackw. t. 118. (1754).

Polygonum Persicaria Linn. Sp. Pl. 361. (1753).

Leeds, Willow Creek at Dunsieith.

360. *Persicaria tomentosa* (Schrank) Bicknell.

Polygonum tomentosum Schrank, Baier. Fl. I. p. 669. (1789).

Leeds.

361. *Persicaria tomentosa glabrior* Lunell. var. nov.

Tomentum tenue, evanescens.

With a thin, vanishing tomentum.

In high grass on the dried-up bottom of Lake Ibsen, Benson Co.

POLYGONUM Disocorides IV: 4. Plinius XXVII: 12.

- Tour. Els. p. 411. (1694). *Polygonum* Linn. in limited sense.

362. *Polygonum aviculare* Linn. Sp. Pl. 362. (1753).

Leeds, Butte, Oberon.

363. *Polygonum littorale* Link in Schrad. Journ. 1:54. (1799).

Leeds, Butte.

364. *Polygonum erectum* Linn. Sp. Pl. 363. (1753).

Leeds.

365. *Polygonum ramosissimum* Michx. Fl. Bor. Am. 1:237. (1803).

Leeds, Butte; Towner; Kulm (Brenckle).

366. *Polygonum ramosissimum latius* Lunell, var. nov.

Perviridis. Folia typo ampliora, latiora.

Rather green. Leaves larger and broader than the type.

Railroad banks, Leeds.

BILDERDYKIA Dumortier, Fl. Belg. Stam. 18. (1827).

367. *Bilderdykia Convolvulus* (Linn.) Dum. l. c.

Polygonum Convolvulus Linn. Sp. Pl. 364. (1753).

Leeds, Butte.

368. *Bilderdykia Convolvulus pumilio* Lunell, in Am. Midl. Nat. Vol. II, p. 288. (1912).

Leeds.

369. *Bilderdykia scandens* (Linn.) Lunell.

Polygonum scandens Linn. Sp. Pl. 364. (1753).

Peninsula of Lake Ibsen, Jamestown.

Order 21. CARYOPHYLLINEAE.

Bartling, *Ord. Nat.* p. 295, (1830), *Bart, et Wend.*, II., p. 137, (1824-5).

Family 38. **SALSOLACEAE** Linn., *Classes Plantarum* (1738).

BOTRYS Dioscorides III: 130. Plinius, *Nat. Hist.* XXVII: 8. 31. Bauhin, *Pinax* p. 138. (1623), *Tour. Fls.* p. 406. (1694). *Vulvaria* Dallechamps, *Hist.* p. 543. (1587), Bubani, *Fl. Pyr.* I. 174. (1897).

370. **Botrys aromatica** (Spach). Nwd. Am. Midl. Nat. Vol. III. p. 275. (1914).

Botrydium aromaticum Spach, *Hist.* p. 295. *Chenopodium Botrys* Linn. Sp. Pl. 219. (1753). *Vulvaria Botrys* (Linn.) Bubani l. c. p. 177.

Fargo (Cl. Waldron).

371. **Botrys glauca** (Linn.) Nwd. Am. Midl. Nat. Vol. III. p. 275. (1914).

Chenopodium glaucum Linn. Sp. Pl. 220. (1753).

Leeds, York.

372. **Botrys hybrida** (Linn.) Nwd. Am. Midl. Nat., l. c.

Chenopodium hybridum Linn. Sp. Pl. 219. (1753).

Peninsula of Lake Ibsen, Willow Creek, Turtle Mountains.

373. **Botrys Fremontii** (S. Wats.) Lunell.

Chenopodium Fremontii S. Wats. *Bot. King's. Exp.* 287, (1871).

Peninsula of Lake Ibsen.

374. **Botrys alba** (Linn.) Nwd. Am. Midl. Nat. l. c. 276.

Chenopodium album Linn. Sp. Pl. 219. (1753).

Leeds, Butte, Narrows (Ramsey Co).

375. **Botrys alba** var. **pauper** Lunell. var. nov.

Caulis simplex vel subsimplex. Spicae florum condensatae, sessiles vel subsessiles.

Stem simple or almost branchless, with flower clusters crowded, sessile or nearly so.

Dry bottom of coulée, Leeds.

376. **Botrys pagana** (Reichenb.) Lunell.

Chenopodium paganum Reichenb. *Fl. Germ.* 579. (1830).

Leeds, Bismarck.

377. **Botrys ferulata** Lunell.

Chenopodium ferulatum Lunell, Am. Midl. Nat. Vol. III
p. 345 and p. 4. (Contents). (1914).

Bismarck on the banks of the Missouri.

378. **Botrys leptophylla** (Moq.) Nwd. Am. Midl. Nat. 1. c.
p. 275.

Chenopodium album leptophyllum. Moq. in D C. Prod. XIII,
2, p. 71. (1849).

Bismarck; Dickinson (O. A. Stevens).

379. **Botrys pratericola** (Rydb.) Lunell.

Chenopodium pratericola Rydb. Bull. Torr. Bot. Club. 39:
310. (1912).

Butte, Pleasant Lake, Narrows (Ramsey Co.).

380. **Botrys subglabra** (Wats.) Lunell.

Chenopodium leptophyllum subglabrum Wats, *Chenopodium
subglabrum* (Wats.) A. Nels. Bot. Gaz. 34: 362. (1902).

Dickinson (L. R. Waldron).

381. **Botrys succosa** (A. Nels.) Lunell.

Chenopodium succosum A. Nels. Bot. Gaz. 34: 361. (1902).

Plant green, very succulent, sending out all along the stem
straw-colored branches, which are longest and strongest at its
base, thus arranged similarly to *B. pagana*. Stamens 5.

Leeds.

382. **Botrys rubra** (Linn.) Lunell.

Chenopodium rubrum Linn. Sp. Pl. 218. (1753).

The whole plant dark red, rather leathery than succulent,
branching from the upper part of the stem like *B. alba*, Stamens 1-2.

Leeds, Minnewaukan.

[The validity of *B. succosa* has been questioned of late, the
examinations apparently having been made on dry specimens.
With the succulence of the former eliminated by the drying process
and the different colors in both species changed to a dusky gray,
common for both, their general appearance shows a similarity
not existing in the fresh plants.]

383. **Botrys humilis** (Hooker) Lunell.

Chenopodium rubrum humile (Hook.) Wats. Bot. Cal. 2: 48,
(1880).

Butte.

MONOLEPIS Schrad.

384. *Monolepis nuttalliana* (Roem. et Schult.). Englm.
Trans. Amer. Phil. Soc. n. ser. 12:206. (1861).
Blitum Nuttallianum Schult. Mant. I: 65. (1822).
Leeds; Pingree (Stutsman Co.).
ATRIPLEX Hippokrates, Theophrastus VII: 1, Plinius,
XX: 20, Columella III: 11, X: 377. Dioscorides 11: 145, Tour.
Els. 405. (1694).
385. *Atriplex hortensis* Linn. Sp. Pl. 1053. (1753).
Probably an escape from former cultivation, Leeds.
386. *Atriplex carnosa* A. Nels. Bot. Gaz. 34:361. (1902).
Leeds, Minnewaukan, Towner.
387. *Atriplex argentea* Nutt. Gen. I:198. (1818).
Leeds, Bottineau.
388. *Atriplex canescens* (Pursh) James, Trans. Am. Phil.
Soc. (II) 2:178. (1825).
Calligonum canescens Pursh, Fl. Am. Sept. 370. (1814).
West of Missouri River.
389. *Atriplex Nuttallii* Wats. Proc. Am. Acad. 9:116. (1874).
Leeds, Brinsmade, and in the western part of the state.
390. *Atriplex ovata* Rydb.
Glen Ullin (Bergman).
SUCKLEYA Gray, Proc. Am. Acad. XI, 103 (1876).
391. *Suckleya Suckleyana* (Torr.) Rydb. Mem. N. Y. Bot.
Gard. I:133. (1900).
Obione Suckleyana Torr. Pac. R. R. Rep. 12: 47. (1860).
Suckleya petiolaris Gray, Proc. Am. Acad. XI: 103. (1876).
Belfield (O. A. Stevens).
EUROTIA Adans. Fam. Pl. 2: 260. (1763).
392. *Eurotia lanata* (Pursh) Moq. Enum. Chenop. 81. (1840).
Diotis lanata Pursh. Fl. Am. Sept. 602. (1814).
Hebron (Bergman).
KOCHIA Roth; Schrad. Journ. Bot. I: 307, pl. 2. (1799).
393. *Kochia Scoparia* (Linn.) Roth; Schrad. Neues Journ.
Bot. 3:85 (1809).
Chenopodium Scoparia Linn. Sp. Pl. 221. (1753).
Introduced. Jamestown, Bismarck.
394. *Kochia trichophylla* Host.
Leeds. Established almost everywhere within the incorpora-
tion.
CORISPERMUM Jussieu, Act., p. 244. (1712).

395. *Corispermum simplicissimum* Lunell, in Am. Midl. Nat. Vol. I, p. 207. (1910).

On a lake shore southeast of Barton, Pierce Co.

396. *Corispermum villosum* Rydb. Bull. Torr. Bot. Club. 24:191. (1897).

Shore of Lake Ibsen (extinct); banks of the Missouri at Bismarck (Brenckle).

SPINACEA. *Tragus* in Brunfels, Herb. Viv. Ic. II, 159 (1531). Also Linn. Sp. Pl. 1027 (1753).

397. *Spinacea oleracea* Linn. l. c.

An occasional escape from cultivation. Leeds.

SALICORNIA Linn. Sp. Pl. 3. (1753).

398. *Salicornia rubra* A. Nels. Bull. Torr. Bot. Club 26. (1899).

Leeds, Mud Lake, Minnewaukan.

399. *Salicornia rubra prona* Lunell, Am. Midl. Nat. Vol. I. p. 236. (1910).

Devils Lake.

DONDIA Adans. Fam. Pl. 2: 261. (1763).

Suaeda Forsk. Fl. Aeg. Arab. 69, pl. 18b. (1775).

400. *Dondia erecta* A. Nels. Bot. Gaz. 34: 364. (1902).

Suaeda erecta (Wats.) A. Nels. in Coult. and Nels. New Man. Rocky Mt. Bot. 169. (1909).

Suaeda depressa erecta Wats. Proc. Am. Acad. 9: 90. (1874).

Leeds, Minnewaukan, Towner.

401. *Dondia depressa* (Pursh) Britt. in Britt & Brown, Illustrated Flora I: 585. (1896).

Salsola depressa Pursh, Fl. Am. Sept. 197. (1814).

Suaeda depressa S. Wats. in King's Geol. Expl. 5: 294. (1871).

Leeds, Butte, Peninsula of Lake Ibsen.

SALSOLA Caesalpinus [Herb. Thornab., 205: 571. (1563)].

De Plantis, p. 170. (1583).

402. *Salisola pestifer* A. Nels. in Coult & Nels., New Man. Rocky Mt. Bot. 169. (1909).

Salsola Tragus Am. authors, not *S. Tragus* Linn.

Leeds, and everywhere.

Family. 39. **AMARANTHOIDEAE** Vent. Tabl. II: 264. (1799).

AXYRIS.

403. *Axyris amaranthoides* Linn.

An asiatic weed, well established in the Turtle Mountains. Of late found at Leeds, Butte and Pleasant Lake.

GALLIARIA Bubani, Fl. Pyr. I: 184. (1897).

Amaranthus Tour. Els. p. 201. (1694), Linn Syst. (1735), etc., not *Amaranthus* Plinius XXI: 8, 23 and ancients, this being *Celosia* Linn.

404. *Galliardia retroflexa* (Linn.) Nwd. Am. Midl. Nat. Vol. III, p. 278. (1914).

Amaranthus retroflexus Linn. Pl. 991. (1753).

Leeds.

405. *Galliardia blitoides* (S. Wats.) Nwd. Am. Midl. Nat. l. c.

Amaranthus blitoides S. Wats., Proc. Am. Acad. XII: 273, (1877).

Leeds.

406. *Galliardia graecizans* (Linn.) Nwd. Am. Midl. Nat. l. c.

Amaranthus graecizans Linn. Sp. Pl. 990. (1753).

Amaranthus albus Linn. Sp. Pl. 1404. (1763).

Leeds.

ACNIDA Mitchell, ex Linn. Act. Ups. 1741. (1746).

407. *Acnida tuberculata* Moq. in D.C. Prodr. 13, p. 2, 278. (1849).

Fargo (Bergman).

408. *Acnida tuberculata prostata* (Uline et Bray).

Acnida tamqrisquina prostata Uline et Bray, Bot. Gaz. 20; 158. (1895).

Leeds.

Family 40. **CORRIGIOLACEAE.** Reichenb. Moessl. Hand., I, 51 (1827).

PARONYCHIA Adans. Fam. Pl. 2: 272. (1763).

409. *Paronychia sessiflora* Nuttall, Gen. !: 160. (1818).

Minot.

Family 41. **NYCTAGINEAE** Vent. Tabl. II: 271. (1799).

ALLIONIA Loeffling, Iter Hispanicum 181. (1758).

Oxybaphus L' Her. Willd. Sp. Pl. I: 185. (1797).

410. *Allionia linearis* Pursh. Fl. Am. Sept. 2: 728. (1814).

Oxybaphus angustifolius (Nutt.) Sweet, Hort. Brit. I: 334

(1826.)

Morton County (W. B. Bell.).

411. *Allionia aggregata* (Ortega). Spreng. Syst. I: 384. (1825).
Calymenia aggregata, Ortega, Nov. Rar. Pl. 8: pl. 11,
 (1798).

Butte, (?); Lisbon 1891 (Standley, Contr. U. S. Nat. Herb.
 Vol. XII, part 8: 344. 1909).

412. *Allionia decumbens* (Nutt.) Spreng. Syst. l. c.

Calymenia decumbens Nutt. Gen. I: 26. (1818).

Oxybaphus decumbens Sweet, Hort. Brit. l. c.

"On high, bare, gravelly hills near Fort Mandan on the
 Missouri" (type locality). Medora (H. L. Bolley).

413. *Allionia decumbens assurgens* Lunell. Am. Midl.
 Nat. Vol. II, p. 123. (1911).

Pleasant Lake.

414. *Allionia nyctaginea* Michx. Fl. Bor. Am. I: 100. (1803).

Oxybaphus nyctagineus Sweet, Hort. Britt. I: 224. (1825).

Leeds, Devils Lake.

415. *Allionia hirsuta* Pursh, Fl. Am. Sept. 2: 728. (1814).

Oxybaphus hirsutus Sweet, Hort. Brit. I: 334. (1825).

416. *Allionia pilosa* (Nutt.) Rydb. Bull. Torr. Bot. Club 29
 690. (1902).

Calymenia pilosa Nutt. Gen. I: 26. (1818).

Butte, Pleasant Lake, Dunsieith, Minot; Walhalla (L. R. Wal-
 dron); Hillsboro (A. B. Lee).

417. *Allionia pilosa parva*, a depauperate form with narrow
 leaves. Name proposed by Prof. Robinson for the variety.

418. *Allionia pilosa rotundifolia* "Seems to be a form of
 this species. It appears to be a depauperate state." (Paul C.
 Standley, Contr. U. S. Nat. Herb. Vol. XII, part 8: 354. (1909)).

Allionia hirsuta rotundifolia Lunell, in Bull. Leeds Herb. no 2,
 p. 6. (1908).

Leeds.

Family 42. **PORTULACEAE** Jussieu, Gen., p. 312. (1789).

PORTULACCA Plinius XX: 20. Tour. Els. p. 203. (1694).

419. *Portulacca sylvestris* Fuchs Hist. Stirp. p. 113. (1542).
 Tragus, Matthioli, Anguillara, Dodonaeus, Camerarius, etc.

Portulacca oleracea var. β . Linn. Sp. Pl. 445. (1753).

Leeds.

420. *Portulacca grandiflora* Hook Bot. Mag. Pl. 2885. (1829).

An occasional escape. Leeds.

(To be continued.)

THE NAIADES OF MISSOURI. — V.

BY WILLIAM I. UTTERBACK.

Genus, *Strophitus* Rafinesque.1820—*Strophitus* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 3161852—*Uniopsis* Agassiz, Arch. fur Naturg., p. 49.(Type, *Anodonta undulata* Say).

ANIMAL CHARACTERS:—Branchial opening densely papillose; anal papillose or crenulate; mantle connection between anal and supra-anal not long and bordered by square, black spots; inner gills larger, inner laminae free from, or united to, the visceral mass; palpi united antero-dorsal for most of their length; color of soft parts variable but with the tendency to have certain parts (such as foot, adductors, mantle edge at branchial opening) orange in color; marsupium peculiar, consisting of ovisacs divided into many compartments at right angles to the laminae; conglutinates short, solid cords, (termed *placentulae* by Ortmann.)

SHELL CHARACTERS:—Shell, subrhomboid to subelliptical, subsolid, inflated, with low post-umbonal ridge; disk smooth; beaks rather full, sculptured with rather heavy concentric bars upcurved behind; epidermis rayed or rayless, polished; hinge teeth mere rudiments, sometimes entirely absent.

Because of the great specialization in marsupial structure, the tendency of the inner lamina of the inner gill to become connected to the visceral mass and also because of a more developed hinge, this genus is the highest of the *Anodontinae*. It is represented in this State only by *S. edentulus*.

Strophitus edentulus (Say.)

("Squaw-Foot," "Creeper.")

Pl. XXIV, Figs. 80 A—D.

1820—*Alasmodonta edentula* Say, New Harm Diss., II, No. 22, p. 340.1888—*Anodonta shafferiana* B. W. Wright, Check List.1900b—*Strophitus edentulus* (Say) Simpson, U. S. Proc. Nat. Mus., XXII, pp. 616-618.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening doubly papillose; anal with inner edge crenulated, supra-anal moderately

connected to anal, mantle edge here blocked in black at regular intervals; inner gills much wider and longer than outer, inner laminae connected about one-half way; palpi united almost to their tips antero-dorsad; color of foot, palpi and adductors orange, variable with age.

REPRODUCTIVE STRUCTURES:—Marsupia occupying outer gills with secondary water tubes, ventral edges distended when gravid, ovisacs occupied by several other smaller sacs arranged crosswise facing the outer and inner laminae in which small, solid white cords (*placentulae*), containing the ova or two to ten larvae, are situated; glochidia large, spined, spadiform, hinge line straight, length greater than height, (0.35x0.285 min).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Elongate-ovate, moderately solid, inflated, post-umbonal ridge usually rounded; female shell more obtusely (or biangulated) posteriorly than male; umbones rather full sculptured by two or three very coarse, wavy concentric ridges abruptly bent up behind; disk not sculptured; epidermis usually a glossy brown, sometimes marked by bright green rays, especially in young shells.

INTERNAL STRUCTURES:—Cardinals almost obliterated, more pronounced in left valve, where it is rounded and placed just under the beaks; laterals and interdentum lacking; umbonal cavities deeper in female shell; naere variable from solid salmon or white, to cream or pearl-blue color.

Sex	Length	Width	Diameter	Um. ra.	Locality
♀	95	x 55	x 38—mm—	0.360—	(Marais des Cygnes R., Rich Hill, Mo.,)
♂	77.5	x 45.5	x 27 —mm—	0.430	(Osage R., Linn Cr.,)
♀	34	x 20	x 14 —mm—	0.330	(102 R., Wyeth, Mo.,)
♂	41	x 24	x 13.5—mm—	0.335	(Grand R., Darlington.)

The last two measurements are those of the only shells of *edentulus* found in the interior north of the Missouri River and these are juveniles. Unlike most adolescent shells of this species, both shells are uni-colored except for a single brownish band parallel with the growth lines near the ventral margin on a back-ground of yellowish-green; hinge teeth and beak sculpture typically *strophiatus*; naere of both about the same; shell thin and translucent.

MISCELLANEOUS REMARKS:—*S. edentulus* is rather easily recognized even through casual observation by its somewhat

inflated elliptical shape with the beak sculpture or coarse concentric bars bent up behind, but, most of all, by its very peculiar marsupial characters which are an adaption to its eccentric habit of independent metamorphosis. This and *Lastena ohioensis* are the only species on record so far that do not normally possess a fish host for the metamorphosis of its larva. This species is not so particular about its habitat and hence it has one of the widest distributions of any species in the United States. It is strange that it should not have a wide distribution throughout the State. It is almost unknown for the interior of North and Northwest Missouri, and is perhaps best represented in numbers and typical form in the Osage basin. Its sub-species, *pavonius* Lea (which, at best, is *perhaps only a color-variant*) is not found in this State. The shell of this species is exceedingly variable, for this State, as to its shape, size and thickness, but these variations are only individual characteristics or deviations due to special local conditions. The author has found the breeding season of *edentulus* to be about as long and over-lapping as that of *Lasmonos fragilis*; however, there was a short interim noted in most individuals about the middle of July when there was more or less sterility. Because of the *great vitality and nonparasitic life of the larvae* and also because of its constancy in breeding season, we might conclude the reasons for its prolificacy and wide geographic distribution; we might conclude, too, that its distribution may be due also to a dependent life as well upon fishes of those larvae that have been observed to escape from the extruded *placentula*, and, as some students have advanced, the buoyancy of the *placentula*, bearing the juveniles, may be the greatest cause for the wide distribution.

Sub-family **Lampsilinae** Ortmann.

1911a—Lampsilinae Ortmann, An. Car. Mus., IV, pp. 337-338; 1912b, An. Car. Mus., VIII, pp. 300-360.

ANIMAL CHARACTERS:—Mantle edge antero-ventrad to branchial opening of the female with special structures, such as papillae, flaps, etc., siphonal openings with tendency to become tubular; supra-anal separated from anal by a mantle connection of medium length; inner laminae of inner gills generally connected with the visceral mass throughout; palpi medium to small; marsupium occupying only the outer gills, or parts of the latter, situated in their posterior portion as a rule; when sterile an extra thickness

of tissue on the ventral border to permit a bulging out; when gravid ovisacs are undivided internally, and distal ends are extended beyond the original edge externally; glochidia of both *Propterc* ("ax-head") and *Lampsilis* ("apron-form") types, varying much in shape and size; conglutinates white, undivided at their distal ends, discharged more or less broken through the thin ventral edges of the ovisacs; color of soft parts modest, never so bright with tinges of yellow or red as seen in the other sub-families, *Unioninae* and *Anodontinae*.

SHELL CHARACTERS:—Shell rounded, sub-elliptical or elongated; beak sculpture generally obscure, when present usually the double looped type, rarely concentric; epidermis rarely dull, usually with bright color markings; hinge teeth rarely reduced, generally complete with well developed teeth; sex dimorphism of shell in most cases well expressed by a truncated or blunted posterior end, by an expanded post-ventral portion, etc.

MISCELLANEOUS REMARKS:—With regard to marsupial structure the Missouri *Lampsilinae* naturally fall into three groups. All these agree, however, in the extension of the membranes beyond the ventral edge of the marsupium when gravid; hence this distention tends to make the membranes thinner so that osmosis may be facilitated. To aid further in this osmotic action, there is a tendency in the three following types to draw the marsupium back toward the branchial opening where there is the greatest amount of aëration due to the action of papillae, caruncles, flaps, etc.

1. *Ellipsaria-Group*. Marsupium most primitive in that the whole outer gill is occupied; yet advantage is secured for the aëration of the embryos in rendering the ventral edges thin by distention and in throwing the marsupia into folds, thus increasing the surface for greater exposure to the water currents. The only representative in this state is *E. clintonensis* (Simpson).

2. *Obliquaria-Cyprogenia-Group*. Number of ovisacs reduced, but each greatly enlarged and elongated and placed at the greatest vantage point for oxygenation of the embryos. This group is represented in Missouri by only two species, *Obliquaria reflexa* (Raf.) and *Cyprogenia Aberti* (Conrad). The former has its few large ovisacs drawn back beyond the middle of the gill, while the latter has its ovisacs slightly in front of the middle of the gill, but extremely elongated into upward coiled spirals.

3. *Proptera-Lampsilis-Group*. In this division the best adaptation for the proper respiration of the embryos is secured by situating the numerous, dilated ovisacs in a more or less kidney-shaped marsupium near to the branchial opening where the postero-ventral margin of the mantle is set with papillae, flaps, etc. The first members of this group have this mantle edge only slightly crenulate and lamellate, while beyond the genus, *Proptera*, is the culmination of the modern structure in the arrangement of the inner edge with papillae or flaps close to, or remote from, the outer edge. This group is represented by about thirty species in this State.

It may be added that the *Lampsilinae* are dissimilar to the *Unioninae* in their breeding season in that practically all the species are long period breeders (bradytictic), but that the glochidia of these two sub-families are similar in form and in being spineless. It is especially to be noted that the members of these two sub-families have developed perfect hinges in the adult shell, whereas those of *Anodontinae* possessing glochidia with spines have defective hinges. We should also note that the *Lampsilinae* are able to spread their valves far apart—a habit which may have some relation to the differentiation of their mantle margins in admitting greater incurrents of water—while the *Unioninae* and *Anodontinae* show a primitive character in being unable to force their valves far apart and accordingly in not developing stronger papillae and more extended mantle edges at their siphonal openings—a defect that may be somewhat counterbalanced by the development of larger palpi than is very often seen in the *Lampsilinae*. It may be stated further that there is not such intergradation of forms in this sub-family as seen among the *Unioninae*, or even as noticed among the *Anodontinae* as there seems to be more distinctness and fixity of characters among the several genera, especially as seen in the marsupial structures upon which a good key is built.

Genus *Ellipsaria* Rafinesque.

1820—*Ellipsaria* Rafinesque, Monog. Biv. Shells of R. Ohio., Ann. Gen. Sci. Phys.

1900b—*Ptychobranhus* Simpson, Proc. Ac. N. Sci. Phila., p. 79.

(Type, *Ellipsaria fasciolaris* Rafinesque 1820 = *phaseolus* Hildreth, 1828).

ANIMAL CHARACTERS:—Branchial opening with papillae; anal separated from supra-anal by short mantle connection but never lacking; inner laminae of inner gills, more or less free from visceral mass; palpi very small, connected about one-fourth of their length; color of soft parts mostly whitish with mantle edge black along the siphonal openings; marsupium occupying whole outer gill with a number of folds; ventral edge, when gravid, presenting a beaded appearance; glochidia medium in size, subovate; conglutinates white, solid, subcylindrical.

SHELL CHARACTERS:—Shell subelliptic rather elongate, arched dorsad, disk smooth; beaks low, sculpturing indistinct, finely concentric, later bars, however, somewhat double-looped; epidermis yellowish to olivaceous, painted with capillary-like rays forming interrupted squarish spots; hinge teeth well formed, branchial impression of female shell very distinct, nacre white to pearl blue.

MISCELLANEOUS REMARKS:—This most primitive genus of *Lampsilinae*, like those of *Anodontinae* and some genera of *Unioninae*, uses the whole outer gill as a marsupium but shows modern character in the special structure of folding. *Ellipsaria* is only represented in this State (and perhaps only for the whole Southwest) by *E. clintonensis* Simpson. Since the shell of this species is about the same form as that of *dilatata* (Raf.) it is often confused with this species of *Elliptio* from which is widely separated by a sub-family. The real test of distinction between these two species is concerning the marsupial characters; hence we see here an instance of shell characters as a poor guide for discrimination even for species of very distant relation.

***Ellipsaria clintonensis* (Simpson.)**

("Kidney Shell.")

Pl. XXV, Figs. 81 A and B.

1900a—*Ptychobranchus clintonensis* Simpson, Pr. Acad. Nat. Sci. Phila., Pt. I, p. 79, pl. V., fig. 3; 1900b, Proc. U. S. Nat. Mus., XXII, p. 613.

1906—*Ptychobranchus clintonense* (Simpson) Scammon, Sci. Bull. Univ. Kans., III, p. 319.

ANIMAL CHARACTERS:—Identical with those of the type for this genus as to its nutritive structures and also as to the repro-

ductive as far as able to determine from sterile material that is only at hand. Glochidia not known.

SHELL CHARACTERS.

EXTERNAL STRUCTURES: Shell elongate-elliptical moderately inflated, obtusely rounded before, pointed behind, dorsal line accurate, ventral with a slight long upward curve; disk smooth; post-umbonal ridge rounded; beaks low, faintly sculptured concentrically across two radiating ridges; epidermis olive green or yellowish rayed with capillary lines, some arranged in bundles.

INTERNAL STRUCTURES:—Cardinals double in both valves, post-cardinal of right valve rudimentary; interdentum long, rather narrow, notched; scars well impressed; beak cavity shallow branchial, however, large with deep impression in female shell; nacre white to pearl blue.

Sex	Length	Height	Diameter	Locality
♀	95	x 50	x 28	—(Spring R., Webb City)
♀	86	x 44	x 25	—(White R., Hollister)
♂	85	x 45	x 24	—(Jack's Rork, Shannon Co.)
♀	60	x 30	x 17.5	—(White R., Hollister)

This last specimen being young and well preserved shows the fine characteristic rays more distinctly and while the beak sculpture would show more distinctly than in older shells yet it is even obscure here and does not add anything to the above description of the external shell structures.

MISCELLANEOUS REMARKS: Before Simpson had studied the soft parts of this species he had considered it as *E. dilatata* (= *U. gibbosus*); however, its peculiar marsupial characters would not only discriminate, but also its different beak sculpture and dissimilar hinge. The beak sculpture of *dilatata* is one of the most emphatic among the *Naiades* while that of this species is one of the most obscure; besides the interdentum of the former is broader and thicker while the branchial impression of *clintonensis* distinguishes it from all other species outside of its genus. This species lies very close to its fellow, *luciolaris*, and it is considered by some as merely a variety of it, but perhaps it is a *good species* on account the lack of the splotched rays and larger, heavier, thicker shell of the type for *Ellipsisaria*.¹ *Clintonensis* is abundant

¹ Recent studies by Dr. Ortmann and Mr. Frierson have resulted in the positive conclusion that the *Unio occidentalis* Conrad (Monog., VII,

locally in the White, Black, and Neosho River basins. Simpson reports it for the Red River, Arkansas; Prof. Isely and Rev. Wheeler also report it for Arkansas and Oklahoma. Thus it seems to have supplanted *fasciolaris* (= *phaseolus*) of the Tennessee drainage for the Southwest.

Genus **Obliquaria** Rafinesque.

1830—*Obliquaria* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 301.
1900b, Simpson, p. 610.

(Type *Obliquaria reflexa* Rafinesque.)

ANIMAL CHARACTERS:—Branchial opening large with papillae; anal crenulated; supra-anal high with moderately short mantle connection to anal; inner laminae of inner gills free from the visceral mass except for a short distance anteriorly; palpi short and small; soft parts grayish; marsupium occupying only outer gills and consisting of 5-7 ovisacs placed posterior to the center of the gill and when gravid extending far beyond the edge of sterile marsupium; glochidia medium in size, semicircular, hinge-line with a slight up-curve in centre; conglomerates large, white, club-shaped, glochidia scattered all through the conglomerated mass.

SHELL CHARACTERS:—Shell medium in size, thick roundly trigonal, inflated; disk of one valve with row of large knob-like nodules running from beaks centrally ventrad and alternating with the knobs on the other valve; beaks sculptured with two or three concentric bars which, although heavy, are not well defined; epidermis greenish-yellow to brown with paintings of numerous interrupted rays; cardinals prominent and ragged; laterals short nearly straight; beak and branchial cavities not very deep; nacre white; female shell smaller and slightly inflated post-ventrad.

MISCELLANEOUS REMARKS:—*O. reflexa* is the type and only member of this genus known thus far and is one of the most easily identifiable of all the *Lampsilinae* not only in its most unique marsupium, but also in the knobbed sculpture of its disk. The sex dimorphism of the shell for this type is rather peculiar as

1836, pl. XXXVI, fig. 23) is the *Pty. clintonense* Simpson (1900-a and b) and hence this species, whose type locality is the Current River, Missouri, should be:—*Ellipsaria occidentalis* (Conrad).

described above and is not often seen among the *Naiades*. In that there are not such advantages for the aëration of the embryos and also a greater reduction in the number of ovisacs as seen in most other genera of this sub-family, this genus is given a primitive grouping here. However, in the reduction of the number of ovisacs a compensation is made in the enlargement and elongation. This genus has a rather wide distribution over the northern and central parts of the state, but is entirely absent from the drainage of the south slope of the Ozarks.

***Obliquaria reflexa* Rafinesque.**

("Horny-Back," "Three-Horned Warty-Back.")

Pl. XXV, Figs. 82 A—F.

1820—*Obliquaria (Quadrula) reflexa* Rafinesque, Ann. Gen. Sci. Phys., p. 306; Chenu. Bib. Conch., 1st ser., III, 1845, p. 19.

1823—*Unio cornutus* Barnes, Am. Jl. Sci., VI, p. 122, pl. IV, fig. 5.

1900b—*Obliquaria reflexa* (Raf.) Simpson, Proc. U. S. Nat. Mus., XXII, p. 611; Ortmann 1912b—An. Car. Mus., VIII, pp. 310-312.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with light colored papillae on a black back-ground; anal crenulated; supra-anal rather large and briefly connected to anal; inner laminae of inner gills free except for a short distance anteriorly; palpi small, wide, short, connected for one-half of their length antero-dorsad; color of soft parts grayish or dirty white, mantle edges at branchial opening black, branchial papillae and inner margin of anal opening yellowish, gills of male and sterile female tan-color.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial, when sterile, the ovisacs not extending below edge of gill, when gravid larger and greatly elongated beyond the original edge, ovisacs 5-7 in number, large, club-shaped, curved post-ventrad, glochidia scattered throughout the conglutinated mass; conglutinates club-shaped, solid, white, discharged whole; glochidia semi-circular, medium in size, hinge line slightly curved upward in middle, measures 0.225 x 0.235mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-trigonal, heavy and thick anteriorly, post-dorsal line rounded; slightly incurved post-

ventrad in male, slightly swollen in female; whole shell medium in size, small but more inflated; disk from beaks to central-ventral edge sculptured with a row of a few large knobbed tubercles, those of one valve alternating with the knobs of the other; post-umbonal ridge with corrugations; epidermis yellowish-green to dark brown.

INTERNAL STRUCTURES:—Cardinals upright, jagged; laterals short, nearly straight at right angles to a rather broad interdentum beak and branchial cavities moderately deep; nacre a pure, stippled white.

Sex	Length	Height	Diameter	Locality
♂	68	x 55	x 35mm	—(Platte R., Platte R. Station)
♀	55	x 45	x 30mm	—(Marais des Cygnes, Athol)
♂	35	x 26	x 17mm	—(Platte R., Dixon Falls)
♀	20	x 15	x 12mm	—(Miss. R., Hannibal)
♂	20	x 14.5	x 9.5mm	—(Crows Fork, Fulton)

The last two are measurements of juveniles of widely different locality under far different ecological conditions, although the shell characters are not very much different. The former shows more of a rayed olivaceous epidermis and the latter a plain straw color. The Mississippi juvenile, being more typical as in case of most shells, is described here:—Shell sub-trigonal, valves inequilateral with two knobs on one side and one on the other, darker green epidermis below the knobs, rayed with interrupted V-markings, beak sculpture irregular concentric undulations extending out on disk; nacre white, slightly tinged with pink.

MISCELLANEOUS REMARKS:—Both as to structure of shell and nutritive soft parts *O. reflexa* is rather primitive, but as to marsupial characters it naturally falls under the lower groups of the *Lampsilinae*. In North Missouri *reflexa* reaches a very large growth while in Central Missouri it averages only about one-half the size; for the two faunae this variation applies to many other species. Since Drs. Lefevre and Curtis (1912, pp. 137 and 138) have called attention to the eccentric breeding habits and glochidial behavior of *reflexa* the writer has followed up the breeding period rather closely to find that it is gravid with early and late embryos, also with glochidia, during June, July and August, but is sterile for late Fall and mid-Winter, thus showing that this species has a short period of gravidity,—a different reproductive habit from

that of most *Lampsilinae*. The fact that the mature glochidia will not leave the conglutinated form after being extruded by the mother and because of the fact, too, that artificial infection of fish cannot be induced with its glochidia would lead to believe that its metamorphosis may take place without parasitism.

Genus *Cyprogenia* Agassiz.

1852—*Cyprogenia* Agassiz, Arch. fur Naturg., p. 47; 1900b, Simpson, p. 609.

(Type, *Unio irroratus* Lea.)

ANIMAL CHARACTERS:—Branchial opening with short papillae; anal finely crenulate; supra-anal closely connected to anal; mantle edge antero-ventrad to branchial opening with fine crenulations for a short distance; inner laminae of inner gills free from visceral mass except at anterior end; palpi very small, pointed, very wide gap between them and anterior attachment of outer gills; marsupium consisting of 5-7 ovisacs anterior to center of outer gills, when gravid ovisacs immensely elongated and coiled post-dorsad; conglutinates white, very long and solid, subcylindrical; glochidia semicircular, medium in size, ventral margin obliquely rounded, hinge line long and slightly upcurved.

SHELL CHARACTERS:—Shell roundly triangular, subinflated; disk with peculiar nodulat structure; beaks more or less prominent, sculpture obscure; epidermis olive, painted with mottled rays; hinge complete; beak cavities rather deep.

MISCELLANEOUS REMARKS:—The type of *Cyprogenia, irrorata*¹ (Lea), is not found in Missouri being entirely displaced by *C. Aberti* (Conrad). The variety of *irrorata pusilla* of Simpson, is so doubtfully reported for the St. Francis River that it is not listed here. Simpson is of the opinion that all *C. irrorata*, reported for the localities west of the Mississippi, are really *C. Aberti*. As to soft parts there is a similarity to those of *Obliquaria*; however, the slight differentiation of the mantle border antero-ventrad to branchial opening and also its uniquely coiled and extremely elongated ovisacs would rank it above.

¹ From Rafinesque's evident description and figures (Ann. Gen. Sci. Brux., V, 1820, p. 312, pl. LXXXII, figs. 4, 5) we should make *C. irrorata* (Lea) a synonym for *C. stegaria* (Raf.)

Cyprogenia Aberti (Conrad.)

("Young Fan-Tail.")

Pl. XXV, Figs. 83 A and B.

- 1850—*Unio aberti* Conrad, Pr. Ac. Nat. Sci. Phila., V, p. 10; 1854, Jl. Ac. Nat. Sci. Phila., p. 295, pl. XXV, fig. I.
 1885—*Unio popenoi* Call, Bull. Washb. Col., I, p. 49, pl. II.
 1900b—*Cyprogenia aberti* (Conrad) Simpson, Proc. U. S. Nat. Mus., XXII, p. 610.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with many short papillae; anal with finely crenulated inner edge; supra-anal separated from anal by short mantle connection; mantle edge antero-ventrad to branchial opening slightly crenulate; gills short, wide, inner wider than outer, inner laminae free from visceral mass, except for a short distance anteriorly; palpi very small, connected about one-half of their distance antero-dorsad; color of soft parts dirty white, except for the black, squarish mottlings of the mantle edges around the supra-anal opening.

REPRODUCTIVE STRUCTURES:—Marsupium formed by five to seven ovisacs originating from the edge of the outer gills antero-ventrad and extremely elongated posteriorly into a coil; conglutinates white, very long, solid, club-shaped; glochidia unknown.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-triangular, compressed; beaks rather pointed, sculpturing obscure; post umbonal ridge prominent with a hummocky expansion middle-ways for the female shell, not so sculptured in male; radial furrow rounded moderately wide; dorsal ridge faintly ribbed; disk entirely rugose; epidermis brownish yellow with numerous banded rays marked with mosaics of green mottlings of various patterns of geometric designs.

INTERNAL STRUCTURES:—Cardinals double in each valve; laterals double in left, single in right; interdentum long; beak cavities deep; nacre bluish, iridescent.

Sex	Length	Height	Diameter	Locality
♂	42	x 32	x 16.5	(St. Francis R., Greenville)
♀	40	x 32	x 16.0	(White R., Hollister)
♂	37	x 30	x 14.5	(" " ")
♀	30	x 22	x 11.0	(" " ")

Although the shell of the last measurement is young and well preserved, yet the beak sculpture does not even present anything very distinct. The beaks are pointed, incurved and two-ridged, - one ridge radiating off to the posterior and the other to the anterior umbonal slope. The shell in this stage resembles that of young *P. securis* from a dorsal view. The soft parts of this specimen show that its marsupial characters consist of seven sterile ovisacs originating just in front of the middle part of outer gill curved backward toward the branchial opening.

MISCELLANEOUS REMARKS:—*C. Aberti* is a rather common little shell in the White, Black and Neosho basins of this State. It is distinguished from *C. irrorata* by not being so rounded, nor so solid, rugose and ridged parallel to growth lines. It is not to say a variable shell, yet the writer has noted some with such a truncated posterior end as to suggest an approach to *irrorata*, or is probably the *C. Aberti lamarckiana* (Lea) reported for the Black River, Missouri. Specimens taken from Indian mounds in Southwest Missouri show great preservation although deposited some centuries ago. As they were placed in these graves for "food" to the departed spirit" (as was the burial custom of the aborigines) in greater quantities than other mussel shells it is evident that this species was prized above all others for its food qualities. It can be determined that the live mussels were deposited since dried muscular tissue is still adhering to the muscle scars.

***Cyprogenia Aberti lamarckiana* (Lea).**

(Not figured, nor described.)

1852—*Unio lamarckianus* Lea, Tr. Am. Phil. Soc., X, p. 266, pl. XVII, fig. 20.

This sub-species is simply listed for this State through a report of it by Mr. Elwood Pleas to the U. S. National Museum, where it is now on exhibit under the number, 124,630 -and also through a recent report of it for the Black River, Popular Bluff, Missouri, by Mr. Walker who has received it in this same collection of Mr. Pleas, a part of which lot was sent to the Washington Museum. No data is at hand for illustration or description.

Genus **Obovaria** Rafinesque.1819—*Obovaria* Rafinesque, J. de Phys. Chim. Hist. Nat., p. 426.(Type, *Unio retusa* Lamarck.)

ANIMAL CHARACTERS:—Branchial and anal opening both papillose; supra-anal large, crenulated; mantle margin antero-ventrad to branchial opening slightly specialized with lamellae or crenulations; inner gills twice the width of outer, inner laminae entirely connected to visceral mass; palpi small, far removed from anterior end of outer gills; color of soft parts soiled white; marsupium consisting of many ovisacs originating from posterior half of outer gills and extending far below the ventral edge; conglutinates poorly developed, embryos being held in rather loose masses; glochidia somewhat large, semielliptical, spineless, hinge line undulate.

SHELL CHARACTERS:—Shell rounded or ovate, inflated, height, greater than length; post-umbonal ridge not distinct, disk smooth; beaks prominent, sculptured with a few indistinct, concentric, sinuate bars; epidermis brown with faint rays.

MISCELLANEOUS REMARKS:—Although this genus is another one of the primitive types of *Lampsilinae*, yet the differentiation of the mantle border antero-ventrad to the branchial opening and the tendency of the marsupium to assume the reniform shape and to acquire a position near the opening of the incoming currents all show and approach to the more modern groups. According to Dr. Ortmann the sub-genera of this genus, as fixed by Simpson, are well defined enough to be retained.

Thus we have the following grouping:—

1.—Sub-Genus **Obovaria** (*sens. strict.*)

Shell upright, oval, rather solid; beaks drawn up more toward the middle of the dorsal line; cardinals mostly normal.

Type, *O. retusa* (Lamarck.)

2.—Sub-Genus **Pseudoön** Simpson (1900b, p. 601).

Shell oblique, elliptical, solid, thick; beaks protruding anteriorly; cardinals subparallel to laterals.

Type, *O. ellipsis* (Lea)

From the above diagnoses it may seem that division is made on the shell characters, the soft parts being identical,—even in marsupial and glochidial characters. However, this Genus is

only represented in this State by *ellipsis* and that in a limited distribution both in the geographical and individualistic sense.

Obovaria (Pseudoön) ellipsis (Lea).

("Missouri Nigger-Head," "Egg Shell," "Hickory Nut.")

Pl. XXV, Figs. 84 A and B.

1828—*Unio ellipsis* Lea, Tr. Am. Phil. Soc., III, p. 268, pl. IV, fig. 4.

1900b—*Obovaria ellipsis* (Lea) Simpson, Proc. U. S. Nat. Mus.; 1912b, Ortman, Car. Mus., VIII, pp. 323-324.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening small with two-ranked papillae; anal finely papillose; supra-anal crenulated (a rare character) not well connected to anal; mantle border just antero-ventrad to branchial opening with crowded papillae or crenulations extending one-third of the way towards center of ventral margin; gills very wide, both blunt and pointed posteriorly, inner laminae of inner gills entirely connected to visceral mass; palpi rather small, connected about one-half of their length antero-dorsad; foot pinkish, mantle edge dark in region of siphonal openings, rest of soft parts dirty white.

REPRODUCTIVE STRUCTURES:—Marsupium occupying posterior portion of outer gills, rather kidney-shaped, consisting of several ovisacs, twenty-five or thirty which, when gravid, extend far below the original edge, pigmented purplish ventrad; conglomerates white, not well formed, ova and glochidia discharged in rather loose masses; glochidium medium in size, semi-elliptic, rather short and straight, measures 0.210 x 0.265mm.

SHELL STRUCTURES.

EXTERNAL STRUCTURES:—Shell sub-elliptical, rather oblique, very solid, thick, heavy; ventral margin more rounded than dorsal; disk smooth; no post-umbonal ridge; rest lines of growth very distinct; beaks projecting anteriorly, rather prominent, sculpturing indistinct; epidermis yellowish-horn color with green rays in young shell.

INTERNAL STRUCTURES:—Cardinals very heavy, nearly parallel to laterals with right post-cardinal converged dorsad and rounded up from a broad V-shaped gutter; interdentum broad, thick, right deeply gashed; beak cavities not very deep; nacre white.

Sex	Length	Height	Diameter	Locality
♀	80	x	61	x 47 (Grand River, Sumner)
♂	70	x	55	x 39 (Mississippi River, Hannibal)
♀	65	x	52	x 41 (Osage River, Warsaw)
♂	30	x	24	x 18 (Mississippi River, Hannibal)
♀	25	x	20	x 14 (" " ")

Beaks of these specimens of the last two measurements very full, rounded, poorly sculptured although not eroded; more inflated (comparatively) than adult shell; epidermis olive with profuse paintings of green rays so as to give the appearance of olive green; post-ventral edge of shell more obliquely rounded than in adult; nacre pearl blue.

MISCELLANEOUS REMARKS:—From shell characters there is no real sex dimorphism except a little greater inflation in the female, but not only a less crowded arrangement of septa is seen in gills of the male but there is a more intense black pigmentation in the region of the branchial opening. *The crenulated supra-anal opening is surely a unique character and may indicate a conversion of this opening into the anal.* The bare connection between the two openings would also indicate this merging. Although of rare occurrence *ellipsis* reaches its greatest perfection for the interior in the Grand River of North Missouri. It is found occasionally in the Osage Basin, but never develops a shell as large, heavy or bright as found in the Grand or in the Mississippi. This fact of difference in size, color and solidity for the shells of these different mussel faunae applies to most other species as well. Scammon (1906, p. 306) reports this species as very active with strong musculature and that he has traced this species for fifty yards by its furrow in the Kansas River. This species is bradytic.

Genus *Nephronaias* Crosse and Fischer.

1893—*Nephronaias* Crosse and Fischer, Miss. Sci., Pt. 7, II, p. 556;
1900b, Simpson, Proc. U. S. Nat. Mus., XXII, p. 591.

(Type, *Unio plicatulus* Charpentier.)

ANIMAL CHARACTERS:—Identical with those of *Obovaria*—even in glochidial characters.

SHELL CHARACTERS:—Shell rounded to sub-elliptic and elongate, usually compressed; posterior ridge rather indistinct, beaks not near the anterior end, sculpture poorly developed,—consists of a few faint double-looped bars; epidermis greenish

to yellowish, generally with very distinct green rays; sex dimorphism of shell not well shown.

MISCELLANEOUS REMARKS:—This genus is set aside solely on shell characters. The sub-genus, *Pseudoön*, serves as a good connecting link between *Obovaria* and *Nephronaias*. Chiefly because of the lack of much specialization of the mantle border antero-ventrad to the branchial opening *Unio ligamentina* (Lam.) is taken out of Simpson's grouping of it as a *Lampsilis*. In this State this genus is best represented by *N. ligamentina* and *ellipsiformis* (Lea).

(To be continued.)

OUR BIRDS IN THE AUTUMN OF 1914.

BY BROTHER ALPHONSUS, C. S. C.

The observation of bird life in autumn must be somewhat unsatisfactory to many lovers of nature. Not a few of the species become gradually much reduced in numbers; they are usually silent, and spend most of the day hidden away in shrubbery. Unless the observer has great enthusiasm in his work, and can devote sufficient time to it, he will not succeed in discovering but comparatively few of the many species that are still staying with us. The writer has found this to be true in his own case, and only when his efforts have been uniformly sustained day after day has he obtained such a record as is shown in the present article.

To show the truth of this statement, I may say that 35 species were recorded only once in one of the autumn months in 1914. These species were: Cardinal, Blackburnian, Wilson, Tennessee, Myrtle, Connecticut, Black-throated Blue, Warblers, Baltimore Oriole, Hummingbird, Scarlet Tanager, Phoebe, Kingbird, Red-breasted Nuthatch, Brown Creeper, Bobwhite, Ruby-crowned Kinglet, Flicker, Mourning Dove, Winter Wren, Catbird, Yellow-billed Cuckoo, Hell Diver, Blue-headed and Yellow-throated Vireos, Chickadee, Tree Fox, Lark, White-throated, Sparrows, Red-winged Blackbird, Towhee, Screech Owl, Pine Grosbeak, Mallard.

The paucity of interesting observations of the habits of the

many species mentioned in this article is due to the fact that the writer has hitherto only incidentally studied the habits of birds, his time having been mostly taken up in obtaining the largest number of species possible during the different seasons of the year. This was done to secure data about the distribution and migration of our birds.

SEPTEMBER.

1.—Heard first Blue Jay in Lawton, four miles from Bankson Lake.—2.—Arrived at Notre Dame, Ind.—Great scarcity of birds a. m. and p. m.—4.—Cardinal on hill-side near St. Joseph's Lake; red under tail but no where else; call-note.—21 species in two hours, a. m.—9.—Song of Thrasher—complete, low and sweet.—10.—A. M. Magnolia Warblers plentiful.—12.—Scarlet Tanager—body yellow, wings and tail black.—Goldfinches still in summer plumage.—18.—First Hermit Thrush, in row of box-elders—very still and hidden.—Female Tennessee Warbler.—19.—A dead Red-head in oak grove.—23.—Turned cool after a week of extremely warm weather.—Autumn migrants late.—Redstarts plentiful west of ice-house.—First Yellow Palm Warblers—plentiful in fields and along roadsides.—30.—Bluebirds and Myrtle Warblers in St. Mary's property, in field containing a few apple trees.—Golden-crowned Kinglets plentiful just inside St. Mary's gate.

There were 17 records for the Chipping Sparrows in 1913 against 2 in 1914. I often find this Sparrow rare in autumn. The Redstart had 12 records in 1913 and only 2 in 1914. As a rule I have not made many records of this warbler in autumn. Another species seldom seen at this season is the Maryland Yellowthroat—4 records in two years. In the last two years September had but 4 records for the Indigo bird; in 1912 there were 9 records. A very rare species both in spring and autumn is the Wilson Warbler—one records in September 1914 and one in August 1912.

OCTOBER.

11.—Wren-like call-note of Ruby-crowned Kinglet; a few notes of the song also. This call-note is an easy way of distinguishing the Ruby-crowned from the Golden-crowned.—Cooler after a month of dry, warm weather.—14.—Note of White-crowned Sparrow resembles one of the Meadowlark's.—Birds abundant near ice-house and in hedges along roadside.—22 species seen today.—22.—Weather fine for nearly a week.—Great increase of

many species.—A pair of Pine Grosbeaks near ice-house; male reddish on head and back; female mottled with brownish and lighter; call-note, distinctive.—25.—Musical call-note of Tree Sparrow in a field; none seen.—27.—First snowfall; few species seen.—31.—A. M.—St. Mary's property.—A large flock of Killdeer flying around a field when flushed.—Fox Sparrows and Chickadees in trees on bank of St. Joseph River.—Weather warm and day bright.

In 1913 there were 5 records for the Flicker, the last made on the 10th; in 1914 the only record for the species was on the 21st. The Tree Sparrow was recorded on 7 days in 1913 and only once in 1914. The Fox Sparrow also had 7 records in 1913 and two in 1914. The Yellow-billed Cuckoo had one record in 1914 and none in 1913. A very rare species here at all seasons of the year is the Winter Wren—one record this year.

NOVEMBER.

6.—Fine weather.—Call-note of Pine Grosbeak, flying, a. m.—8.—A number of Brown Creepers seen.—Golden-crowned Kinglets in spruce trees on Novitiate grounds.—Musical call-note of Tree Sparrow.—Snowbirds plentiful.—10.A. M.—Clear and windy.—Only 3 species seen.—12.—4:15 p. m.—Kinglets near Grotto.—Flock of birds flying high—perhaps Goldfinches.—16.—Snowstorm.—Only heard Crow.)21.—Large flock of crows in grove near Novitiate; kept moving; no time when all were resting; cawing continuously; watched them five minutes when most of them departed; a few remained even as I passed by.—22.—6:45 A. M.—Two Robins near chicken yard of Seminary.

The Meadowlark was not recorded in 1914; one record in 1913—the 4th.—The Killdeer had 2 records in 1914; none in 1913.—The Chickadee had one record in 1914 and 18 in 1913. Here is an instance of great disparity in distribution, for which this species is remarkable.—The Fox Sparrow had a single record in 1914 and none in 1913.—The same was true of the White-throated Sparrow and Bluebird.—The Kingfisher had no record in 1914 and one in 1913.—The Hairy Woodpecker had a record identical with the Kingfisher.—The Towhee and Red-winged Blackbird each had one record in 1913 and 1914.—The Golden-crowned Kinglet had 3 records in 1914 and 2 in 1913.—The Screech Owl was recorded once in 1914 and twice in 1913.—The Myrtle

Warbler had 2 records in 1914 and one in 1913.—The Hell Diver was not recorded in 1914 and was seen three times in 1913.—The Pine Grosbeak had no record for 1913.

SEPTEMBER.

- | | |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| Crow, 1, 4, 5 to 9, 11, 12, 13, 16,
17, 19, 20, 22 to 30. | Maryland Yellowthroat, 3, 10. |
| Blue Jay, 1 to 30. | Wilson Warbler, 8. |
| Red-head Woodpecker, 1 to 7,
9 to 24, 26 to 30. | Bay-breasted Warbler, 12, 23. |
| Downy Woodpecker, 2, 4, 5, 7,
8, 14 to 24, 26, 28, 29, 30. | Tennessee Warbler, 18. |
| Goldfinch, 2 to 29. | Yellow Palm Warbler, 23 to 29. |
| Song Sparrow, 2 to 13, 15, 16,
18 to 30. | Myrtle Warbler, 30. |
| Vesper Sparrow, 3, 4, 15. | Bronzed Grackle, 2 to 8, 10, 11,
12, 14 to 24, 28, 29, 30. |
| Field Sparrow, 3, 5, 7, 8, 9,
12 to 30. | Kingfisher, 1, 2, 4, 5, 7, 11, 12,
16, 17, 18, 20, 21, 23. |
| Chipping Sparrow, 5, 16. | Mourning Dove, 2, 3, 4, 5, 7
to 10, 16, 18, 27, 29. |
| White-throated Sparrow, 24 to
29. | Cowbird, 3, 13, 18, 20. |
| Lark Sparrow, 30. | Towhee, 25, 26. |
| Cardinal, 4. | House Wren, 1, 5, 7, 10 to 16,
18, 19, 21, 22, 25, 26, 28. |
| Meadowlark, 17, 19, 23, 24, 27,
29, 30. | Flicker, 1, 3 to 7, 10 to 13, 16,
18 to 21, 23, 26. |
| Robin, 1 to 9, 11, 14, 15, 17 to
24, 26 to 30. | Brown Thrasher, 3, 5, 10, 12,
13, 15 to 21, 23, 25, 26. |
| Bluebird, 1, 2, 23, 28, 29, 30. | Catbird, 2, 3, 4, 7, 9 to 19. |
| Redstart, 1, 24. | Killdeer, 2, 4, 5, 7 to 11, 14, 16
18, 19, 21, 22, 27 to 30. |
| Black and White Warbler, 1, 12. | Spotted Sandpiper, 6, 11, 12. |
| Black-throated Green Warbler,
1, 5, 11, 12, 13, 17, 18, 21,
23, 24, 27 to 29. | Baltimore Oriole, 1. |
| Pine Warbler, 8, 9, 10, 12, 13,
14, 16, 17, 21, 22, 23, 27, 30. | Warbling Vireo, 1, 3, 4, 5, 6, 7,
12, 15. |
| Ovenbird, 1, 6. | Red-eyed Vireo, 19, 26, 27, 29 |
| Blackburnian Warbler, 1. | Yellow-throated Vireo, 1. |
| Nashville Warbler, 23, 29. | Indigo Bird, 2, 4, 18. |
| Magnolia Warbler, 4, 5, 10, 13,
16, 18, 19, 21, 22. | Nighthawk, 1, 3. |
| | Bobolink, 3, 4, 7, 23. |
| | Hummingbird, 1. |
| | Yellow-billed Cuckoo, 4 to 8
19, 21, 30. |

- Lesser Yellowlegs, 13, 17, 19.
 Hell Diver, 1, 3, 5, 6.
 Screech Owl, 4, 6, 11.
 Scarlet Tanager, 12.
 Hermit Thrush, 18, 19, 25, 27.
 Chimney Swift, 2 to 8, 10 to 15,
 17, 19, 20 to 24, 26, 27, 29.
 Snowbird, 24, 26, 27, 28, 30.
 Least Flycatcher, 5, 13, 20, 23,
 24, 25.
 Wood Pewee, 1 to 7, 12, 14, 15.
 Phoebe, 28.

Total number of species seen, 68.

OCTOBER.

- Crow, 1, 2, 3, 5, 6, 7, 10, 11, 13
 to 17, 19 to 31.
 Blue Jay, 1 to 12, 14 to 31.
 White-breasted Nuthatch, 4, 7,
 11, 13, 14, 18, 19, 20, 26, 27,
 28, 31.
 Red-headed Woodpecker, 1 to
 6, 11, 12, 14, 16, 18 to 23,
 27, 31.
 Downy Woodpecker, 1, 3, 5, 6,
 7, 9, 14, 16, 17, 18, 20, 21,
 24, 28 to 31.
 Flicker, 21.
 Song Sparrow, 1 to 9, 11 to 23,
 25, 27, 28.
 Field Sparrow, 1, 2, 3, 5 to 23,
 26, 29.
 Savanna Sparrow, 1, 3.
 Lark Sparrow, 5, 17, 19.
 White-throated Sparrow, 1, 2, 3,
 5, 7, 9, 12 to 15, 17 to 26,
 28, 30.
 White-crowned Sparrow, 12, 14,
 17, 18, 21.
 Fox Sparrow, 19, 31.
 Kingbird, 3.
 Red-breasted Nuthatch, 24.
 White-breasted Nuthatch, 1, 3,
 4, 5, 7 to 10, 12 to 15, 17 to
 19, 21, 22, 23, 26, 27, 29.
 Brown Creeper, 30.
 Yellow-bellied Sapsucker, 27,
 29, 30.
 Bobwhite, 29.
 Ruby-crowned Kinglet, 29.
 Golden-crowned Kinglet, 29, 30.
 Tree Sparrow, 25.
 Bronzed Grackle, 1, 2, 3, 6, 7,
 10, 12, 14, 15, 17, 18 to 23, 25.
 Red-winged Blackbird, 12, 13 19
 Cowbird, 2, 17, 19, 20.
 Kingfisher, 14, 18.
 Killdeer, 1, 2, 3, 5 to 8, 12, 14,
 16, 19, 20, 31.
 Mourning Dove, 14.
 Towhee, 2, 3, 5, 12 to 17, 19 to
 23, 25.
 House Wren, 1, 4, 5, 6, 17.
 Winter Wren, 17.
 Chickadee, 7, 21, 31.
 Red-shouldered Hawk, 13, 17.
 Meadowlark, 2, 3, 5, 6, 8, 10, 11,
 14, 17, 18, 19, 20, 21.
 Goldfinch, 1, 2, 3, to 10, 14, 17,
 19 to 24, 26, 28.
 Catbird, 17.
 Yellow-billed Cuckoo, 2.
 Hermit Thrush, 1, 2, 3, 9, 11
 to 14, 16, 17, 18, 20.
 Chimney Swift, 1, 2, 3, 4, 5,
 7, 8, 15.

- Screech Owl, 6.
 Snowbird, 1, 2, 3, 5, 7, 8, 9,
 11 to 31.
 Sapsucker, 1, 3, 11.
 Phoebe, 2, 3, 4, 7, 13, 18, 20, 24.
 Ruby-crowned Kinglet, 2, 11,
 14, 20, 21, 23.
 Golden crowned Kinglet, 1 to
 6, 11, 12, 14, 16 to 24, 26 to 31.
 Brown Creeper, 1, 12, 14, 18,
 19, 26, 28, 29, 31.
 Robin, 1, 2, 3, 12, 14, 16, 18, 19.
 Bluebird, 3, 5, 11, 12, 14, 16, 17,
 18 to 23, 25, 30, 31.

Total number of species seen, 50.

NOVEMBER.

- Crow, 2, 3, 4, 6 to 10, 12 to 18,
 20 to 27, 29.
 Blue Jay, 1 to 12, 14, 15, 19,
 20, 22 to 30.
 White-breasted Nuthatch, 1, 2,
 4, 6 to 9, 11 to 15, 19 to 23,
 26 to 30.
 Red-headed Woodpecker, 2, 7
 to 9, 11 to 15, 17, 18, 22, to
 25, 30.
 Downy Woodpecker, 1, 2, 4, 5,
 7, 8, 9, 11 to 14, 17, 18, 20 to 30.
 Goldfinch, 3, 6, 7, 8, 11, 12, 13,
 17, 22, 23, 25, 28, 29.
 Chickadee, 3.
 Song Sparrow, 1, 3, 5, 6, 8, 9,
 11, 27, 30.
 Fox Sparrow, 4.
 Lark Sparrow, 1.
- Hell Diver, 21.
 Pine Grosbeak, 22.
 Blue-headed Vireo, 20.
 Connecticut Warbler, 20.
 Black-throated Green Warbler,
 5, 15.
 Black-throated Blue Warbler, 18
 Pine Warbler, 6, 12, 26.
 Nashville Warbler, 1, 6, 11, 19.
 Yellow Palm Warbler, 15, 17,
 18, 20, 22, 31.
 Myrtle Warbler, 1 to 4, 9, 11
 to 31.
- White-throated Sparrow, 29.
 White-crowned Sparrow, 5, 6.
 Tree Sparrow, 4, 5, 7, 8, 11,
 13, 26.
 Killdeer, 2, 17.
 Robin, 2, 22.
 Bluebird, 2.
 Red-winged Blackbird, 6.
 Towhee, 11.
 Screech Owl, 28.
 Myrtle Warbler, 1, 21.
 Brown Creeper, 1, 6, 7, 8, 9,
 11, 13, 14, 26, 28.
 Golden-crowned Kinglet, 7, 8, 12
 Snowbird, 1 to 15, 18, 19, 21
 to 30.
 Pine Grosbeak, 6.
 Mallard, 25.

Total number of species seen, 25.

Total number of species seen in autumn, 81.

CRITICAL NOTES OF NEW AND OLD GENERA OF PLANTS.—VI.

BY J. A. NIEUWLAND.

NYCTERIUM.

The plants now included generally in *Solanum* having the fifth stamen different in shape and usually larger than the other four well deserve by this one notable character alone, to constitute a separate genus. The name *Nycterium* for these plants was proposed by Ventenat.¹ Two species are native within the limits of this country. The genus well deserves the recognition it had already by a considerable number of noted botanists, such as Torrey, Link, Lindley, Sweet, Don, Engelmann, etc.

Nycterium Vent. l. c.

Solanum Linn., in part.

Nycterium rostratum Link, Enum. Hort. Berol I, 189 (1821).

Solanum rostratum Dunal, Sol., 234 pl. 24 (1813), *Solanum heterandrum* Pursh, Fl. Am. Sept., 156, pl. (1814). *Nycterium heterandrum* Heynh., Norm. II, 440 (1840).

Nycterium citrullifolium (Braun) Nwd.

Solanum citrullifolium Braun, Ind. Sem. Frib. (1849).

PTERETIS AGAIN.

In the September number of *Rhodora* Fernald² shows that our Ostrich Fern is really distinct from the European *Mattucia Struthiopteris* and gives it the name *Mattucia nodulosa* (Michx.) Fernald (*Onoclea nodulosa* Michx.). We³ have already pointed out that *Pteretis* Raf. (1818) antedated *Mattucia* Todara (1866). Was not perhaps *Pteretis* rejected with right for the reason given that names held to for fifty years are *nomina rejicienda* to give way to later *nomina conservanda*. A moment's reflection will show that even if the name *Mattucia* had been *universally accepted*, which is not true, it had not been accepted for fifty years at that. Then for what reason was it cast off. We had suggested several reasons why it might not prove acceptable.⁴ We

¹ Ventenat, E. P., Malm. sub. t. 85 (1803).

² Vol. 17, p. 161 (1915).

³ Am. Mid. Nat., Vol. III, 197 (1914).

⁴ Am. Mid. Nat. l. c.

have guessed rightly, as we knew before hand we should, when so many alternatives were offered. In any case to try to determine what the "codists" of one persuasion, or the other might do in any given case where elementary logic may be thrown "to the winds" with impunity, is one of the lightest and most useless of occupations. According to the "American Code" the plant in question ought to have been called *Pteretis nodulosa* (Michx.) nov. comb., what the codists of any belief or none will call it depends to much on individual whims or so-called "interpretation" to be worth while venturing a guess, as the case in question actually showed beyond our expectation.

PSYLLIUM.

By habit as well as good characters of inflorescence *Plantago Psyllum* Linn. as also *Plantago arenaria*. stand apart so strikingly that they may well be considered in the segregated genus *Psyllium*. The genus was recognized by the ancients and many a one with fewer reasons for recognition is now maintained without question. We have often insisted that plants monoicous, and dioicous are not to be put in a genus with those, that have perfect flowers. In this very family the *Plantaginaceae* we have the genus *Limosella* that enjoys scarcely any other distinctive characters than such emphasized here and no one questions the validity thereof. Botanists would do well to be consistent in generic recognitions. The trivial name of the type *Plantago Psyllum* Linn. was used for this plant in generic designation by Dioscorides (4: 170) and was accepted by the older botanists. The plants of this proposed genus group differ from *Plantago* proper in being annual leafy-stemmed plants with flowers in capitate clusters instead of spikes. One species is reported from our region.

Psyllium (Diosc.) Juss., Gen. 90 (1789).

Psyllium arenarium (W. & K.) Mirb., Hist. XIV. 333 (1814).

Plantago arenaria W. & K., Pl. Par. Hung. I, 5: pl. 51, (1894)

MARGARITA LISTER.

The name *Margarita Lister*¹ for a plant of the *Myxomycetes* base on the type *Physarum metallicum* Berk & Br.² can not obtain because there is an older application of the genus name *Mar-*

¹ Lister, A., Monograph of Mycetozoa, 203 (1894).

" G., " " " 256 (1911).

² Mag. Zool. Bot., I, 49 (1838).

garitas a segregate of *Aster*, under *Aster Bellidiastrum*. To replace the invalidated and therefore inapplicable *Margarita* Lister the name *Calomyxa* may be suggested.

Calomyxa Nwd., Nom. Nov.

Margarita Lister, Mycetozoa l. c. (1894) (1911), not *Margarita* Gaudin (1829).

Calomyxa metallica (Berk. & Br.) Nwd.

Margarita metallica (Berk & Br.) Lister, l. c. *Physarum metallicum* Berk & Br., Mag. Zool. Bot. I. 49 (1838). *Cornuvia metallica* Rost. Mon. App. 35.

IN REMEMBRANCE.

RESOLVED that in the death of Doctor Edward Lee Greene the California Academy of Sciences has lost one of its most eminent members and the world one of its leaders in systematic botany. With sublime devotion to science he gave up all he had, time, energy and what money could be spared from his frugal needs to carrying on his work, publishing at his own expense a mass of original material to be compared in extent only with that of Asa Gray. Probably no other American botanist has published so many new species and genera and certainly no other has made such great sacrifices to carry on his work.

His wide travels and his rare powers of observation and discrimination gave him a personal knowledge of more living plants than is possessed to-day by any other botanist.

He collected at his own expense one of the best botanical libraries in this country and an herbarium rich in types of new species. It is greatly to be regretted that this library and herbarium are not in some Pacific Coast institution where their use would be greatest since his epoch making work was done on the Pacific Coast flora.

He possessed that rare type of courage, namely the courage of his convictions, and alone carried the banner of what to him was the truth in the face of the greatest opposition. No wonder that such a man who was also blessed with an attractive personality and whose knowledge was so great and so freely bestowed, drew

¹ Gaudin, J. F., Fl. Helv. V, 335 (1829).

to him the young enthusiasts whose ideals were as fresh as his own.

The example of his life remains to keep alive unselfish ideals and nobility of character.

The California Academy of Science has a permanent memorial of this remarkable man in his botanical papers which appeared in the two Bulletins of this institution. The herbarium also possesses many type of species described by him which were saved from the great fire. Since then he has sent to the new herbarium some valuable specimens containing duplicates of some of his types.

Our sympathy goes to those friends and relatives who have lost one who is personally beloved.

Resolved that a copy of these resolutions be sent to friends and relatives, to the Smithsonian Institution, the Biological Society of Washington, the Washington Academy of Science, Notre Dame University and the Catholic University of America.

Alice Eastwood, California Academy of Science.

Douglas H. Campbell, Stanford University.

Eugene W. Hilgard, University of California.

* * *

The friends of Dr. Edward Lee Greene, who died November 10, 1915, met at the home of Mrs. Margaret Downing, 1262 Lawrence Street, Brookland, D. C., Sunday afternoon, December 12, 1915.

Dr. Burns, President of the Holy Cross College, represented Notre Dame University, and about forty other intimate friends of Dr. Greene were present.

Dr. Burns stated that it was the wish of our friend that no formal services be held in Washington, but that the funeral be at Notre Dame; therefore we are assembled by the common sentiment of love, respect, and veneration for dear Dr. Greene at this informal gathering. The invitation to attend this meeting was extended to all friends, so far as was possible.

Letters of sympathy and regrets from Mrs. Senator Bourne, Dr. J. A. Zahm, and Dr. H. Hyvernart, one of the oldest professors of the Catholic University and one who had been closely associated with Dr. Greene, were read. Postmaster General Burleson was unexpectedly prevented from attending, and sent a note

expressing his regret that he could not be present to pay tribute to his good friend.

Senator Knute Nelson, of Minnesota, who knew Dr. Greene intimately as a boy, having been one of his schoolmates, expressed his gratification at being able to be present, and related how Dr. Greene became interested in botany in his younger days, having received inspiration and instruction from a Swedish botanist, Thure Ludwig Theodore Kumlien, who lived in his neighborhood. In later years the Senator found him as a professor of botany in the Catholic University, and they renewed their friendship. He spoke of him as being kind-hearted, congenial, industrious, and having a most lovable disposition; he felt that he never had a better friend in Washington. Besides being a man of the highest integrity, and entirely fearless, he was an eminent scientist, and a great scholar—not in the sense of having just one idea—his views covered more than the subject of botany; it was therefore very unfortunate that his life could not be spared much longer. "Nothing was so painful and so grievous to me as the news of Dr. Greene's death."

Mr. W. E. Safford, Secretary of the Botanical Society of Washington, in his tribute said that while Dr. Greene was a great botanist, he was not an orthodox botanist. He made it a point to do honor to those to whom honor was due, and tried to keep the memory of the very old botanists from sinking into oblivion.

Dr. W. A. Orton took pleasure in testifying to the esteem in which the younger botanists of Washington held Dr. Greene for his wonderful knowledge of ancient languages and his broad views which placed him in a unique position.

He described a meeting of the Botanical Society, given in honor of Dr. Greene, which hardly a member of the Society failed to attend. "It is now a lasting pleasure to have paid that tribute to the Doctor while he was here among us."

Dr. C. O. Townsend admired Dr. Greene greatly because he was an inspiration to every one interested in the work of botany; he often recalls the kindly expression which was on his face when he arose in the botanical meetings to address them—he seemed to tower above them all. The memory of Dr. Greene is therefore very pleasant and very beautiful.

Dr. Theodore Holm, Dr. Greene's oldest friend in Washington,

could not reconcile himself with the thought that Dr. Greene had gone, for he was his only real congenial friend in America—the only one who could fluently speak of botany and knew everything about ancient botany. His knowledge of the specific flora of America could hardly be reached by any one else; he brought out very many new points in plant descriptions. He said he could not adequately express the loss sustained in Dr. Greene's death, and he hoped that his memory would always be kept alive.

Dr. Moore, of the Catholic University, read a sketch of the life of Dr. Greene, written by Dr. J. A. Nieuwland, Editor of *THE AMERICAN MIDLAND NATURALIST*, published at Notre Dame University; he also paid high tribute to Dr. Greene's helpfulness to young students.

Dr. Dunn, who for a number of years was associated with Dr. Greene in the Catholic University, read from Dr. Greene's own manuscript an experience entitled "A Walk Across the Desert," a part of his autobiography.

Dr. Burns closed the meeting by reading the Thirty-Eighth Psalm as translated into English by Dr. Greene from his own Greek testament.

The following motion was introduced by Dr. V. K. Chestnut, which was seconded by Mr. Safford, and unanimously prevailed:

"We have assembled together to-day, through the kind courtesy of our esteemed hostess, to meet the friends of Dr. Edward Lee Greene, and we have been charmed by the reading from the pen of Dr. Greene himself the wonderfully interesting story of his early pioneering experiences while botanizing in the great trackless desert regions of the United States.

"We have been enabled to hear this story through the courtesy of Dr. Cavanaugh, President of Notre Dame University, to whom the manuscript of the autobiography has been entrusted, and through Dr. Dunn, of the Catholic University, who has kindly read the manuscript to us.

"I wish, therefore, to move, Mr. Chairman, that a rising vote of thanks be extended to each of these persons, and I would also include in this vote of thanks the names of our worthy presiding officer, Dr. Burns, President of Holy Cross College, and Dr. Nieuwland, Editor of the *MIDLAND NATURALIST*, who so thoughtfully sent the portraits and the book plates of our most esteemed friend and fellow botanist."

Respectfully submitted,

W. G. EISENHART,

Secretary of the Meeting

VOL. IV.

MARCH, 1916.

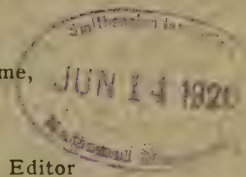
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that of the Prairie States

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J. A. NIEUWLAND, C. S. C., Ph. D., Sc. D., Editor



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THE NAIADES OF MISSOURI.—VI.

BY WILLIAM I. UTTERBACK.

Nephronaias ligamentina (Lamarck).

Pl. XXV, Figs. 85 A and B.

1819—*Unio ligamentina* Lamarck, An. San. Vert., VI, p. 72.

1900—*Lampsilis ligamentina* Simpson, Proc. U. S. Nat. Mus., XXII,
p. 539.

1912b—*Nephronaias ligamentina* (Lam.) Ortmann, An. Car. Mus.,
VIII, p. 325.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Branchial opening large with strong papillae; anal distinctly crenulated; supra-anal rather small, well separated from anal by thick mantle connection; gills very large, inner laminae of inner gills entirely connected to visceral mass; palpi very large, wide and pointed; color of soft parts dingy white for most part, however, post-mantle edge brownish.

REPRODUCTIVE STRUCTURES:—Marsupia occupying most of outer gills, consisting of about sixty ovisacs well separated by thick septa, when gravid extending far below original edge of sterile marsupium, making a longitudinal line; mantle edge antero-ventrad to branchial opening with twenty-five or thirty low denticulations; conglutinates white, broad, leaf-like, solid when ova are present, cohesion lost when mature glochidia are developed; glochidia semi-elliptical, spineless, large, hinge line undulate, measures 0.220 x 0.260mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell rather evenly elliptical, solid, moderately inflated, beaks rather low, sculpture consisting of several fine, wavy, concentric lines most pronounced at foot of posterior and anterior slopes; disk smooth; epidermis brown or yellowish with broad, dark-green rays.

INTERNAL STRUCTURES:—Cardinals rather stumpy and stout; interdentum rather short and cut away; laterals very strong; naere white with stippled effect—a very valuable shell commercially for this reason.

Sex	Length	Height	Diameter	Locality
♀	110	x 68	x 44.5mm	(Marais des Cygnes, Rich Hill)
♂	110	x 65	x 43.5mm	(Meramec R., Meramec Highlands)
♀	90	x 59	x 32.0mm	(Osage R., Osceola)
♂	35	x 21	x 10.0mm	(Gasconade R., Gascondy)
	15.5	x 8	x 4.0mm	(St. Francis R., Greenville)
	8.5	x 5	x 3.0mm	(St. Francis R., Greenville).

These last two measurements are those of *two byssiferous juveniles* identified by Dr. Howard and Prof. Clark. At first the writer was inclined to call them *L. luteola* chiefly on the grounds that both were found clinging by their byssi to a *costata* shell in a bed where *luteola* predominated; however, this identification was excluded on the basis of the presence of anterior rays and a difference of umbonal sculpture being less prominent with the ridges more broken in case of juvenile *ligamentina* as shown in these two specimens. The byssus is attached to the upper posterior part of the foot although it extends out antero-ventrad between the valves. In the smaller juveniles the byssus is about 120mm long, in the larger 135mm. Both bear dense papillae on both branchial and anal openings. Anterior end of outer gills lifted up very high above the palpi, gills dark tan-color; branchial papillae rusty red; epidermis yellowish with bright broad green rays—mostly placed anteriorly.

MISCELLANEOUS REMARKS:—While *N. ligamentina* may have the widest general distribution of the North American *Naiades*, yet it is not found anywhere in the interior of this State north of the Missouri River. However, it is the most common of species in the Mississippi, the Des Moines and in all the interior drainage south of the Missouri. It is not inclined to vary much from the typical *ligamentina* of Lamarek; however, the Osage River contains some forms that are somewhat puzzling due to ecological conditions that erode the epidermis and distort the shell of this species (and of other characteristically rayed species, for that matter), but these are of rare occurrence in the Osage from the center of its course to its mouth. As mentioned elsewhere this local effect may be traced to the chemical reaction of the mineral water of the springs' region. There are no species it may be confused with

except *N. ellipsi formis* when the former is young. However, the more elliptic shell with broader, straighter rays would serve as the main distinguishing features. Surber (1913, p. 109) has found that its glochidium is a gill parasite upon the white bass (*R. chrysops*) as a natural host. Breeding records have been carefully kept for this species, especially for commercial reasons, to find that it is typically bradytictic.

***Nephronaias ligamentina gibba* (Simpson).**

1900b—*Lampsilis ligamentinus gibbus* Simpson, Proc. U. S. Nat. Mus., XXII, p. 540.

("Southern Mucket," "Yellow Mucket.")

ANIMAL CHARACTERS:—Identical with those of the parent species, except, of course, in short gills and other modified parts due to a shorter shell. The glochidia are the same.

SHELL CHARACTERS:—Shell "peculiarly short, humped form" (Simpson); thicker, heavier more inflated with more roughened growth lines and more of a yellowish epidermis than the parent shell.

Sex	Length	Height	Diameter	Locality
♂	85	x	60	x 40mm (Osage R., Monegaw Springs)
♀	80	x	64	x 40mm (" " Linn Creek)
♀	89	x	70	x 38mm (" " Bagnell)

MISCELLANEOUS REMARKS:—*Gibba* seems to be a rather common variety throughout the southern range of the species and is especially characterized by the short, stout, "humped" form of shell. Perhaps it bears the same relation to its species as *dakotana* Frierson does to *grandis* Say. The writer's experience in the study of the form of *ligamentina* while on a 300-mile float down the Osage was that it was difficult to ascertain the point of separation between the species and the variety, *gibba*, so imperceptibly do they grade into each other. This form is met with in drainage of the Ozark Center as well—especially in the Black River.

***Nephronaias ellipsiformis* (Conrad).**

("Ellipse.")

Pl. XXV, Figs. 86 A—D.

1836—*Unio ellipsiformis* Conrad, Monog. VIII, p. 60, pl. XXXIV, fig. I.

1845—*Unio spatulatus* Lea, Proc. Am. Phil. Soc., IV, p. 164.

1898—*Lampsilis spatulatus* Baker, Moll. Chicago, Pt. I, p. 106, pl. X, fig. 5; pl. XIII, fig. 2.

1900b—*Lampsilis ellipsiformis* Simpson, Proc. U. S. Nat. Mus., XXII, p. 557.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with numerous yellowish papillae; anal very finely papillose; supra-anal small, high, closely but distinctly connected to anal; gills large, pointed even in the marsupial ones; inner laminae of inner gills connected entirely to visceral mass; palpi sickle-shaped; color of soft parts the usual dirty white with posterior mantle edges blackened.

REPRODUCTIVE STRUCTURES:—Marsupium occupying posterior half of outer gills, consisting of about twenty ovisacs separated by thick septa, when gravid extending below the original edge of sterile marsupium, tips pigmented with bluish, beaded spots; mantle edge antero-ventrad to branchial opening with papillae terminating in rather fine crenulations centrad-ventrad; conglomerates and glochidia unknown.

EXTERNAL STRUCTURES:—Shell small, elliptical, dorsal and ventral lines about the same curvature; post-umbonal ridge rather rounded; beaks very low, usually eroded, even in the youngest shells, thus sculpture not seen; epidermis brownish-yellow with bright waved rays all over disk; no sculpturing on disk; shells somewhat sexually dimorphic, the female being rather swollen post-ventrad.

INTERNAL STRUCTURES.—Cardinals strong, upright; inter-dentum large and thick; laterals short, stout, very slightly curved; beak cavities shallow; nacre white, sometimes with slight pinkish tinge and teeth rusty-red.

Sex	Length	Height	Diameter	Locality
♂	56	x 33	x 22.5mm	(Gasconade R., Gascondy)
♂	43	x 28	x 21.5mm	(Osage R., Warsaw)
♀	41	x 25	x 17.5mm	(" " , Proctor)
♀	35	x 22	x 7.5mm	(Niangua R., Hahatonka)

MISCELLANEOUS REMARKS:—This little striped shell is common throughout Central Missouri, but is never found anywhere in the interior north of the Missouri River and is rare in the southern drainage. Its shell may sometimes be taken for young *N. ligamentina*; however, the adult shells of these species are nothing alike. The anatomy of both are very similar; however, the inner mantle edge antero-ventrad to branchial opening is more specialized and indicates a step in advance. Hundreds of females were examined

daily throughout July and the first two weeks of August to find them sterile in every case. Since Wilson and Clark (1912, p. 48) report it gravid for an earlier date this incomplete breeding would indicate that it is bradytictic.

***Nephronaias ellipsiformis venusta* (Lea).**

Not figured.

1838—*Unio venustus* Lea, Tr. Am. Phil. Soc., VI, pl. II, fig. 4.

1900b—*Lampsilis venustus* Simpson, Proc. U. S. Nat. Mus., XXII, p. 543.

ANIMAL CHARACTERS:—Entirely identical with those of the species both as to nutritive and reproductive structures. No glochidia have been found.

SHELL CHARACTERS:—Also identical with the typical *ellipsiformis*-shell except for a small guttered furrow just antero-parallel to post umbonal-ridge of shell. The male shell of this sub-species is also more pointed posteriorly than the male type species.

Sex	Length	Height	Diameter	Locality
♂	60	x 37	x 22mm	(Niangua R., Hahatonka)
♀	55	x 31	x 22mm	(" " " ")

MISCELLANEOUS REMARKS:—The writer heartily agrees with Mr. Walker that *venusta* is very closely related to *ellipsiformis* and also with Mr. Frierson's opinion, that it is only a form of *ellipsiformis*. The type locality for *U. venustus* of Lea is Potosi, Washington County, Missouri, and belongs to the Meramec River basin. Simpson (1900b, p. 543) only reports it for that locality. Since then Rev. Wheeler has reported it for Arkansas; so has Wilson and Meek (1912, p. 19.). The writer has only found it in the Niangua River. Having such limited distribution and such lack of discriminating features from *N. ellipsiformis* there should be no hesitancy in naming *venusta* as a variety. From *N. pleasii* this subspecies differs by a ticker, heavier, more coarsely rayed and more of a tawny colored shell.

***Nephronaias Pleasii* (Marsh).**

("Bleeding 'Tooth," "Pleas' Shell.")

Pl. XXV, Figs. A—D.

1891—*Unio pleasii* Marsh, "The Observer" (a newspaper), II, May; Nautilus, V. p. 2.

1900b—*Lampsilis pleasii* Simpson Pr. U. S. Nat. Mus., XXII, p. 557.

ANIMAL CHARACTERS:—No females have been secured by the

writer; however, the nutritive structures of the males are identical with those of *N. ligamentina* and *ellipsiformis*.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-elliptical, rather thin, smooth, somewhat compressed, rounded before, obtusely angular behind; beaks rather low, sculptured by three or four fine shaped undulations; epidermis brown polished horn, with numerous green capillary rays, disposed mostly posteriorly and showing through the thin shell on the inside.

INTERNAL STRUCTURES:—Cardinals small, single in right, double in left valve, erect and parallel with laterals; left inter-dentum cut away for post-cardinal tooth; beak cavities rather shallow; nacre bluish, coppery or salmon in umbonal cavity.

Sex	Length	Height	Diameter	Locality
♂	55	x 21	x 13 mm	(White R., Hollister)
♂	35.5	x 21.5	x 13.5 mm	(" " ")
♂	30	x 18	x 12 mm	(James R., Galena)

MISCELLANEOUS REMARKS:—According to Mr. Marsh this shell bears some resemblance to *Unio spatulatus* Lea (i. e., *U. ellipsiformis* Conrad), but differs chiefly in being thinner, smaller and more compressed. It is like *venusta* in that the female shell is deeply emarginate or constricted in front of post-umbonal ridge as the writer determines from the author's description (1891, p. 2). This species was dedicated to Mr. Elwood Pleas of Indiana who collected this Species, together with many other rare Species, from South Missouri. It was also collected by Mr. S. M. Godbey at Morrisville, Polk Co., Missouri, who sent it to the National Museum where it is now recorded under the number, 132634. The writer found *pleasii* as a rather common shell in the White River, this State.

Nephronaias ozarkensis (Call).

("The Ozark Shell.")

(Not figured.)

1887—*Unio ozarkensis* Call, Pr. U. S. Nat. Mus., X, p. 498, pl. XXVII;
1895, Tr. Ac. Sci. St. Louis, VII, pp. 33-34, Pl. XVIII.

1900b—*Lampsilis ozarkensis* Simpson, Pr. U. S. Nat. Mus., XXII,
p. 557.

ANIMAL CHARACTERS:—Reference to rough field notes show

that the soft parts are those of *Nephronaias*. The shell was identified later as *ozarkensis* of Call.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-elliptical, smooth, rather compressed; post-umbonal slope somewhat biangulate by siphonal ridges; beaks not prominent, sculptured by three fine undulations; epidermis brownish-yellow or olive with numerous fine green rays over central portion of disk; sexually dimorphic.

INTERNAL STRUCTURES:—Cardinals tend to double in both valves, laterals rather short, slightly curved; nacre usually white, sometimes salmon or pink, iridescent; muscle scars confluent.

Sex	Length	Height	Diameter	Locality
♀	55.0 x	35.0 x	21.0	(Jack's Fork, Current R.)
♂	54.5 x	32.7 x	15.2	(Jack's Fork, Current R.)

MISCELLANEOUS REMARKS:—The latter measurement is that of Call's taken for a shell from the same locality (which is one of the type localities of *ozarkensis*) as for the shell of the first measurement which is now in the hands of the writer through the kindness of Mr. B. F. Bush, but which is now too much damaged through shipment for figuring. Its shell is very much like that of *N. pleasii* as to general outline, but is a little thicker and has a different nacre and epidermis. Forms of this Species reported by Meek and Clark (1912, p. 18) for the White River drainage and described as like "a very elongated *Quadrula coccinea*" and also identified by Mr. Walker as "*Pleurobema* rather than species of *Lampsilis*" are doubtless only *Pleurobema utterbackii* of Frierson. Definite assignment to the latter may be made for shells received from the White River, Hollister, Missouri, under the name of *ozarkensis* with the note:—"although not having *Lampsiline* beak sculpture." The reader is invited to compare descriptions and illustrations of *Neph. ozarkensis* and *Pleu. utterbackii* and note that the shell of the former does not possess such tumid beaks, nor such a furrowed post-slope, nor such distinct muscle scars, and its shell has its whole facies of a thinner, lighter character, thus being more inclined to a *Lampsiline* structure.

Genus *Amygdalonia* Crosse and Fischer.

1893—*Amygdalonia* Crosse and Fischer, Jour de Conch., pp. 31-32;
1900b,—Simpson, Proc. U. S. Nat. Mus., XXII, p. 604 (as subgenus for *Plagiola*).

(Type, *Unio cognatus* Lea.)

ANIMAL CHARACTERS:—Anal opening crenulated; supra-anal widely separated from anal; inner laminae of inner gills connected to visceral mass except for a small posterior slit; palpi small; marsupia consisting of several ovisacs at posterior half of outer gill that acutely tapers; conglutinates white, undivided; glochidia smallest of all *Naiades*.

SHELL CHARACTERS:—Shell among the smallest, roundly triangular, inflated, flattened on post-dorsal slopes; post-umbonal ridge sharply angular; disk smooth; beak rather full, sculptured with a few ridges, the latter ones being rather definitely double looped; epidermis greenish to yellowish with characteristic paintings of green arrow-marked rays; female shell slightly more inflated post-ventrad; hinge teeth delicate; nacre usually white.

MISCELLANEOUS REMARKS:—Although this genus stands very close to *Obovaria* and *Nephronaias*, having essentially identical structures of soft parts, yet it deserves this compartment on account of its unique form, size and color markings of shell and especially upon its glochidial characters, being the smallest on record. The only two members of this genus are represented in this State by *A. donaciformis* (Lea) in North Missouri and by *truncata* (Raf.) in Central Missouri. The latter is never found north of the Missouri River and the former is rarely ever found in Central Missouri; neither have been found by the writer in South Missouri. The Osage River bears many intergrades for these two species.

***Amygdaloniaias donaciformis* (Lea).**

("Fawn's Foot," "Deer-Toe," "Zigzag.")

Pl. XXV, Figs. 89 A—D.

1828—*Unio donaciformis* Lea, Tr. Am. Phil. Soc., III, p. 267, pl. IV, Fig. 3.

1820—*Unio zigzag* Lea, Tr. Am. Phil. Soc., III, p. 440, p. XII, fig. 19.

1898—*Plagiola donaciformis* Baker, Moll. Chicago, Pt. I, p. 92, pl. XIII, fig. 4; 1900b, Simpson, Proc. U. S. Nat. Mus., XXII, p. 605.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening small with numerous papillae; anal indistinctly crenulated; supra-anal separated by a long and thick mantle connection to anal; inner laminae connected to visceral mass except for a narrow slit

anteriorly; palpi small, connected one-half of their length antero-dorsad; color of soft parts dirty white except for blackish mantle edge at siphonal openings.

REPRODUCTIVE STRUCTURES:—Marsupia rather low on post-ventral portion of outer gills; when gravid the numerous distinct ovisacs extend below the original edge of gill; glochidia *smallest on record, measuring 0.600 x 0.063 min., semicircular, spineless, hinge line short, very slightly undulated*; conglutinates white, loosely connected when glochidia mature.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell very small, compressed, rounded before, pointed high behind; post-umbonal ridge rather prominent; disk smooth; beaks rather full sculptured by five upward angled bars extending out as finer concentric lines in later bars; epidermis green or olivaceous, painted with radiating green rays of zigzag or arrow-marks; female shell inflated post-ventrad.

INTERNAL STRUCTURES:—Cardinals double in left, single in right valve, compressed, high and ragged; interdentum narrow; laterals single in right, faintly double in left; nacre pearl blue or white, rarely pink.

Sex	Length	Height	Diameter	Locality
♂	54	x 30	x 22mm	(Grand R., Gallatin)
♀	35	x 22	x 15mm	(Platte R., Dixon Falls)
♀	33	x 20	x 14mm	(" " Agency Ford)
♂	14	x 8.5	x 9.5mm	(Grand R., Darlington)
♀	11	x 7.0	x 4.5mm	(" " Chillicothe)

The last two are among the smallest juveniles in the writer's collection. The smallest meets with the following description:—Post-umbonal ridge sharply angled; beaks prominent, well up toward middle of dorsal line, sculptured by five early bars bowed upward in the center, the latter ones being rather fine, concentric; epidermis green with costa-like paintings on the post-dorsal ridge; disk with two rows of zigzag paintings parallel to the growth lines. Four juveniles of this species were found in the Osage clinging to one byssal thread, but unfortunately they were lost.

MISCELLANEOUS REMARKS:—Typical *donaciformis* may be easily distinguished from *Amyg. truncata* in possessing a smaller shell, more painted, thinner, less inflated, more dorsally ridged, and is more of an inhabitant of quiet water with mud-sand bottom. *Donaciformis* is more supplanted in Central Missouri by *truncata*

(Raf.), but, as stated before, it takes the place of the latter wholly in North Missouri. The North Missouri Grand River bears *donaciformis* in its most typical form. The writer finds this species most colonial in their habits, and has been able to find many of them nearly every month of the year, but has not found any gravid during the winter. The earliest date for the bearing of glochidia is June 19th. No previous public record has ever been made of this unique glochidium. From the above data it may be inferred that it is not bradytictic as is mostly the breeding habit of the *Lampsilinae*. This little mussel is also eccentric in that while in the parasitic stage it develops an adult shell five times the size of the glochidial one. Surber (1913, p. 109) finds that its specific distributor is "Sheep's Head" (*A. grunniens*).

***Amygdaloniaias truncata* (Rafinesque).**

("Deer-Foot," or "Deer-Toe.")

XXV, Fig. 88 A and B.

1820—*Unio truncata* Rafinesque, Ann. Gen. Sci. Phys. Brux.

1831—*Unio elegans* Lea, Am. Phil. Soc., IV, p. 83., pl. fig. 13.

1898—*Plagiola elegans* Baker, Moll. Chicago, Pr. I, p. 91, pl. XXI, fig. 1; 1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 604.

1912b—*Amygdaloniaias elegans* (Lea) Ortmann, An. Car. Mus., XXII, p. 328.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Identical with those of *donaciformis*.

REPRODUCTIVE STRUCTURES:—Branchial mantle margin a little more thickened with slight crenulations than in *donaciformis*; glochidia a little larger, measuring 0.060 x 0.070 mm—otherwise these structures are identical with those of *donaciformis*.

SHELL STRUCTURES.

EXTERNAL STRUCTURES:—Shell short, roundly triangular, inflated; post-umbonal ridge sharply angulated from beaks to posterior point of shell; disk smooth; beaks rather prominent, sculptured with a few fine ridges more or less double-looped or sinuated; epidermis yellowish, brownish or even greenish with beautiful paintings of green broken by arrow-marked rays; no sex dimorphism of shell, both sexes being rather swollen post-ventrad.

INTERNAL STRUCTURES:—With the exception of a deeper and

more rounded out branchial cavity and somewhat coarser cardinals these structures are identical with those of *donaciformis*.

Sex	Length	Height	Diameter	Locality
♂	50	x 36	x 25 mm	(Osage R., Linn Creek)
♀	43	x 34	x 23 mm	(Gasconade R., Gascondy)
♀	38	x 30	x 17 mm	(Osage R., Schell City)
♂	37	x 27	x 16.5 mm	(" " Proctor)

MISCELLANEOUS REMARKS:—As pointed out under the description of *donaciformis*, *truncata* is as distinct when typical as its only con-generic ally—especially in its broadly truncated shell post-dorsad. Neither is *truncata* so sexually dimorphic; however, the male shell is unusually more elongated and pointed posteriorly and has less inflation. Both sexes have their shells rather expanded post-ventrad. This species is rarely found in South Missouri, (the writer not having made personal collections of it there at all) although it is really more of a southern species than *donaciformis*. It is not to say very typical in the Osage or Gasconade basins where there are many intergrades for it and its ally, but reaches its greatest perfection in the Mississippi. The breeding habits of this species is the same as that of *donaciformis* as far as records show.

Genus *Plagiola* Rafinesque.

1819—*Plagiola* Rafinesque, J. de Phys. Chim. Hist. Nat., p. 426;
1852, Agassiz, Arch. Fur Nat., p. 48, (redefined); 1900b, Simpson, Pr.
U. S. Nat. Mus., XXII, p. 603.

(Type, *Unio securis* Lea.)

ANIMAL CHARACTERS:—Anal opening smooth, connected to supra-anal by close mantle attachment; inner laminae of inner gills free or partly connected to visceral mass; gills brownish—all other soft parts tannish; marsupium rather reniform consisting of 40-50 well defined ovisacs; conglutinates lanceolate, not very solid; glochidium spatulate, very much higher than long, spineless, very large.

SHELL CHARACTERS:—Shell sub-triangular, solid, not greatly inflated, with square cornered post-umbonal ridge and flat post-dorsad; disk smooth; beaks pointed, rather high, sculptured with faint double-looped ridges; epidermis yellow with broken rays; cardinals low and jagged; laterals rather stout, straight or slightly curved; nacre white.

MISCELLANEOUS REMARKS:—The chief characteristic of this

genus is in its peculiar shell and glochidial characters. As to its animal characters it is essentially that of *Obovaria* and *Amygdalonaias*. Because of its spatulate and higher-than-long glochidia there is "a transition," as Dr. Ortmann aptly puts it, "toward the glochidia of the *Proptera-type*," which has essentially the same hinge line and rounded ventral margin, but with different posterior and anterior ends.

***Plagiola securis* (Lea).**

(Butterfly.)

Pl. II, Figs. 5a—6b.

1829—*Unio securis* Lea, Tr. Am. Phil. Soc., III, p. 437, pl. XI, fig. 17.

1834—*Unio lineolata* Say,¹ Am. Conch., VI.

1900b—*Plagiola securis* (Lea) Simpson, Proc. U. S. Nat. Mus., XXII, p. 603.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Branchial opening rather small with numerous papillae; anal crenulated; supra-anal very large closely, but definitely connected by mantle edges to anal; anus tentacled; inner laminae of inner gills free about three-fourths of their length from the visceral mass; palpi large, connected one-third of their length antero-dorsad; color of soft parts tan, or cream color with gills brownish and papillae yellowish.

REPRODUCTIVE STRUCTURES:—Marsupium composed of about twenty-five ovisacs placed in the posterior half of outer gill; mantle border antero-ventrad to branchial opening with about fifteen very low, irregularly placed papillae; marsupium when charged with ripe glochidia color of brown sugar, somewhat kidney shaped; conglutinates not very solid; glochidia subelliptic or spatulate hinge line very short, ventral margin round, spineless, much higher than long (0.230 x .330mm).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell sub-triangular, not very much inflated, compressed in umbonal region, truncated narrowly post-dorsad; disk more or less smooth; beaks somewhat pointed and directed anteriorly, sculptured with a few fine concentric

¹ This name, as employed by Say, was really preoccupied by Rafinesque in his Monograph of 1820 and hence through priority this species should bear the name *Plagiola lineolata* (Raf.) in spite of the fact that Simpson considered this as one of the many "indeterminates" of Rafinesque.

and indistinctly double-looped ridges; post-umbonal ridge square cornered from beaks to post-extreme; epidermis yellowish or light brown painted with rays broken into square or lunate blotches; female shell smaller, thicker, shorter and more inflated than male.

INTERNAL STRUCTURES:—Cardinals rather low, ragged the right one having four vertical subparallel ridges; interdentum broad; laterals stout, rather long and sharply inclined; beak cavities, moderately deep; nacre silvery white, iridescent.

Sex	Length	Height	Diameter	Locality
♂	96 x	79 x	33mm	(Merame R., Meramec Highlands)
♀	70 x	56 x	37mm	(Marais des Cygnes, Athol)
♀	67 x	53 x	30mm	(Miss. R., Hannibal)
♂	48 x	36 x	16mm	(" " LaGrange)

MISCELLANEOUS REMARKS:—*P. securis* being more of a marine type of shell than fresh water renders it worthy of the creation of a genus. The young shell is like that of an "exquisite shell from the sea-shore," so narrowly flattened is it post-dorsal portion of shell, so delicately painted with broken lunate rays and so arched forward are its compressed and pointed umbones. This species is not found at all in the interior north of the Missouri River; neither is it found in Southwest Missouri. It is rather common in the Osage, Gasconade and Meramec though not very typical as a rule. The most perfect *securis* is the Mississippi. The writer found this species from the Mississippi bearing ripe glochidia June 22nd; Wilson and Clark (1914, p. 52) found the Cumberland *securis* in the same gravidity June 3-16. Dr. Ortmann finding it gravid in late fall again fixes its breeding season as normally bradytictic.

Genus *Lasmonos* Rafinesque.

- 1820—*Lasmonos* Rafinesque, Monograph, Ann. Gen. Sci. Phys. Brux.
 1911b—*Paraptera* Ortmann, Mem. Car. Mus., IV pp. 331, 334, 338.

(Type, *Lasmonos fragilis* Rafinesque.)

ANIMAL CHARACTERS:—Siphonal openings large inclined to be tubular; supra-anal high, well separated from anal; inner laminae of inner gills entirely connected to visceral mass; palpi free their whole length post-dorsad, color of soft parts grayish with yellowish papillae on blackened mantle edge or branchial opening; marsupium kidney-shaped, consisting of several ovisacs occupying posterior part of outer gills; conglutinates white, leaf-like, not

very solid; glochidia very small, sub-ovate; spineless, hinge line short, slightly curved.

SHELL CHARACTERS:—Shell thin, sub-elliptical, alated, compressed; post-umbonal ridge lacking; disk smooth; unbones low marked with fine concentric lines followed by later double-looped bars; epidermis glistening tawny, rayed; sex-dimorphism shown in wider more blunt vertically at posterior end of female shell; hinge teeth reduced to rudiments.

MISCELLANEOUS REMARKS:—This genus is also constructed on the basis of characters relating to shell and glochidia rather than to anatomical structures. On basis of glochidial characters alone it classes with *Amygdalonaias*; however its shell characters throw it near to the genus *Proptera*. *Lasmonos* is represented in this State by its type (which is the commonest shell in North Missouri) and by *simpsoni* Feriss. The latter is grouped here tentatively until its soft parts are studied as its shell characters more closely relate it to the type of this genus than to any other. The species, *Leptodea leptodon* Rafinesque, is perhaps congeneric here and much depends upon its marsupial and glochidial characters, which are as yet unknown; however, the writer has not been fortunate enough to secure live specimens of this species (not even dead shells) in this State, but, because of the use Rafinesque made of it, we are concerned here for nomenclatural reasons, for should it be found to be really congeneric with *fragilis*, aside from its several shell characters, the generic name, *Leptodea*, would take preference to the one herein used.

***Lasmonos fragilis* Rafinesque.**

("Paper Shell," "Razor Back.")

Pl. IX, Fig. 19; Pl. XXVI, Figs. 90 A—D.

1820—*Lasmonos fragilis* Rafinesque, Mono. Biv. of Ohio.

1823—*Unio gracilis* Barnes, Am. Jl. Sci., VI, p. 274.

1861—*Unio dolosus* Lea, Jl. Phil. Ac., V, p. 75.

1900b—*Lampsilis gracilis* Simpson, Pr. U. S. Nat. Mus., XXII, p. 573.

1912b—*Paraptera gracilis* Ortmann, An. Car. Mus., VIII, p. 331.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening round, with spreading, yellowish tentacles; anal slightly crenulated, with thickened edges and normal diaphragm; supra-anal long, extending to dorsal ala, usually closed; mantles parallel at edges, dark colored

and thickened on edges of siphonal openings, white patch at base of branchial papillae, crenulated along border in front of branchial opening, post-ventral region of mantle darker than that of female; palpi united only at base, very long in old specimens; foot large, powerful, very extensile; gills dark tan, pointed posteriorly, inner gills longer and broader than outer, inner laminae of inner gills entirely connected to visceral mass.

REPRODUCTIVE STRUCTURES:—Marsupia occupying posterior part of outer gill, reniform, consisting of about forty, leaf-like ovisacs and, when gravid, extending beyond original edge of gills, the extreme thickness of tissue here allowing the bulging out until glochidia escape through the ruptured edge; conglutinates white, elongate, leaf-shape, not very solid, usually surrounded with brick-red matter; glochidia among the very smallest (0.085mm. by 0.075mm.) belonging to the *Lampsilis* type (i. e., semi-elliptical, ventral margin rounded, gaping, hookless, short hinge line which is slightly undulate.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell medium in size, thin, alate, posterior end of female shell blunt; beaks compressed, marked with three or four wrinkles arranged in a double loop ending with two or three rather nodulous elevations at the base of the post-umbonal slope; epidermis straw color with bright green rays in young and well preserved specimens.

INTERNAL STRUCTURE:—Cardinal teeth very weak, single in each valve; lateral teeth more solid, long, lamellar, elevated, no interdentum; muscle scars faint, retractor large and peculiarly placed; beak cavity shallow; nacre pearl-blue with the usual characteristic pink on the posterior portion.

Sex	Length	Width	Diameter	Um. ra.	Locality
♀	80	x 40	x 23	0.250	(Perche Cr., Columbia)
♂	140	x 70	x 47	0.210	(Grande R., Utica)
♀	74	x 38	x 26	0.275	(Platte R., Agency Ford)
♀	70	x 37	x 25	0.283	(102 R., St. Joseph)
	21.5	x 11	x 5.5	0.260	(Osage R., Colley's Ford)

BYSSIFEROUS JUVENILE:—The latter measurement is taken from a juvenile collected in the Osage River, Colley's Ford Mo., July 15, 1913. It possessed a bysuss 160mm. long and was attached to a plicate shell. This byssal thread was so strong that it pulled off with some difficulty and was split in three strands near its

base, each being marked by a muscilaginous substance. The umbonal markings of this flat straw-colored juvenile shell consists of four broadly inverted V-shaped ridges the rear line being finer, longer and closer together, extending down the posterior umbonal ridge.

MISCELLANEOUS REMARKS:—*L. fragilis* is distinctly a river form for this State, although we would naturally think that this alated and thin-shelled species would be established in the lakes and other quiet waters of Northwest Missouri, especially where it predominates the streams. Breeding records for this species show that it may bear glochidia every month of the year except for a few weeks in mid-summer; hence, a very long period breeder. It was found in August distending its ovisacs with water preparatory to ovulation. Only two other species possess smaller glochidia—those of *Amygdalonajas donaciformis* (Lea) and *A. elegans* (Lea) with which *fragilis* is closely related; however, external characters of shell alone—especially as to size and form—show no close connection. *Fragilis* may be distinguished from other similar alated forms by its peculiar yellow surface, marked by brown horn-colored restlines, depressed umbones, green rays in young and broadly elliptical outline in old specimens, if their alae are lost as is often the case. Through special cooking tests the writer has found out that nearly all the soft parts of this species is very edible. It is also economically important in producing pearls, since it is easily parasitized. No mussel is more active and as it anchors itself so firmly it is often extracted from its bed with great difficulty. The straw-colored and green rayed juveniles are easily located, not so much by color as by their "tracks" since they are the most active crawlers. This species is the most abundant in the One-Hundred-and-Two, Platte, Grand, Tarkio, Osage—in fact all the streams of Northwest and Central Missouri as determined by personal collections. It is poorly developed in the Osage and is not found at all further South in the clear-water streams of the Ozarks. Simpson reports it for the Missouri River, but I think he means only for the tributaries of the Missouri as no mussel life is actually reported in the main stream of this River throughout the State. Its general distribution is for the entire Mississippi River drainage; St. Lawrence system; Red River of the North; Eastern Texas and Cumberland River.

(To be continued.)

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—V.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—V.

With Notes by J. Lunell.

Family 43. **ALSINEAE** Bartling, Ord. Nat. p. 304. (1830).

ALSINE Dioscorides IV: 75. Plinius XXV: 11. Tour. Êls. p. 208. (1694). Linn. Syst. (1735.) and Gen. (1737).

Stellaria Linn. Gen. (1737) and (1754).

421. ***Alsine media*** Fuchs. Hist. Stirp. p. 106. (1546).

Turtle Mountains: St. John.

422. ***Alsine longifolia*** (Muhl.) Britton in Mem. Torr. Bot. Club 5: 150. (1894).

Stellaria longifolia Muhl., Willd. Enum. Hort. Berol. 479. (1809).

Peninsula of Lake Ibsen, Butte, Towner, Pleasant Lake, Turtle Mountains.

423. ***Alsine longipes*** (Goldie) Coville, Contr. Nat. Herb. 4: 70 (1893).

Stellaria longipes Goldie, Edinb. Phil. Jour. 6: 327. (1822).

Leeds, Butte, Thorne.

424. ***Alsine crassifolia*** (Ehrh.) Britton. Mem. Torr. Bot. Club 5: 150. (1894).

Stellaria crassifolia Ehrh. Hannov. Mag. 8: 116. (1784).

Spring in ravine, Butte.

425. ***Alsine borealis*** (Bigel.) Britton, Mem. Torr. Bot. Club 5: 150. (1894).

Stellaria borealis Bigel. Fl. Bost. Ed. 2: 182. (1824).

Pleasant Lake.

CERASTIUM Dillenius, Cat. Pl. Giss. p. 41, etc. (1718).

426. ***Cerastium oreophilum*** Greene, Pittonia 4: 297. (1901).

Leeds, Butte, Minot.

427. ***Cerastium brachypodum*** (Engelm.) Robinson in Britton, Mem. Torr. Club V: 150. (1894).

Cerastium nutans brachypodum Engelm. in A. Gray, Man. Ed. V: 94. (1867).

Dickinson (Cl. Waldron).

428. **Cerastium longipedunculatum** Muhl. Cat. Pl. 46. (1813).

Cerastium nutans Raf. Préc. Somiolog. 36. (1814).

Turtle Mountains: St. John.

MOEHRINGIA Linn. Gen. 162. (1742), 170. (1754).

429. **Moehringia lateriflora** (Linn.) Fenzl. Verbr. Alsin. table, p. 18. (1833).

Arenaria lateriflora Linn. Sp. Pl. 423. (1753).

Willow City, Peninsula of Lake Ibsen, Towner, Minot, Devil's Lake, Turtle Mountains.

SPERGULA Linn. Sp. Pl. 440. (1753).

430. **Spergula arvensis** Linn. l. c.

Leeds.

Family 44. **CARYOPHYLLEAE** B. Juss. Hort. Trianon (1759), Jussieu, Gen., LXVII, and 299. (1789).

GITHAGO Tragus, Hist. 1552; Adans. II: 255. (1763).

431. **Githago segetum** Link, Diss. Bot. Suerin., 62. (1795).

Agrostemma Githago Linn. Sp. Pl. 435. (1753).

Lychnis segetum C. Bauhin, Pinax, p. 204. (1623).

Leeds, Butte.

432. **Githago segetum** var. **nanum** (Hn) Lunell.

Agrostemma Githago var. *nanum* Hartman in Neuman, Sveriges Flora 527. (1901).

Butte, among the type.

SILENE Lobelius, Obs. p. 242. (1576). Linn. Syst. (1735), etc.

433. **Silene antirrhina** Linn. Sp. Pl. 419. (1753).

Willow City (Bottineau County).

434. **Silene antirrhina depauperata** Rydb.

Towner.

435. **Silene noctiflora** Linn. Sp. Pl. 419. (1753).

Leeds, Butte.

VAHLBERGELLA Fries. Bot. Notiser. 143. (1843).

Vahlbergella Blytt, Norges Flora, III, 1070 (1876).

436. **Vahlbergella Drummondii** (Hook.) Rydb. Bull. Torr Bot. Club. 39: 318 (1912).

Silene Drummondii Hook. Fl. Bor. Am. I: 89. (1830).

Lychnis Drummondii S. Wats. in King. Geol. Exp. 5: 37. (1872).

Leeds, Butte, Dunsieith, Towner.

GYPHOPHILA Linn. Sp. Pl. 406. (1753).

437. **Gypsophila elegans** Beib.

An occasional escape, Leeds.

VACCARIA Dodonaeus, Pempt. I: 4, 20. (1583).

438. *Vaccaria vulgaris* Host. Fl. Anst. I: 518. (1827.)

Saponaria Vaccaria Linn. Sp. Pl. 409. (1753).

Leeds, Butte.

DIOSANTHOS Theophrastus, Hist. VI: 1, 6. Bubani, Fl. Pyr. III: 89. (1901).

439. *Diosanthos barbatum* St. Lager. Ann. Soc. Bot. Lyon. VII: 87 (1880), Bubani l. c. p. 93.

Dianthus barbatus Linn. Sp. Pl. 409. (1753).

Occasionally escaped, Leeds.

Order 22. RANALES.

Engler in Eng. & Prantl. Pflanzfm. Nachtr. p. 347 (1897).

Family 44. **CERATOPHYLLEAE** D. C. Prodr. III. p. 73. (1828).

DICHOTOPHYLLUM Dillenius, Nov. Gen. p. 91. (1719).

440. *Dichotophyllum demersum* (Linn.) Moench, Meth. p. 345. (1794).

Ceratophyllum demersum Linn. Sp. Pl. 992. (1753).

Leeds (extinct).

Family 45. **NYMPHAEAEAE** Salisbury, Koenig and Sims, Ann. Bot. I: 70. (1806).

NYMPHONA Marcellus Virgilius, Comm. Diosc. p. 440. (1529).

441. *Nymphona advena* (Soland.) Nwd. Am. Midl. Nat. Vol. III. p. 295. (1914).

Nymphaea advena Soland. Ait. Hort. Kew. II: 226. (1789).

Nuphar advenum R. Br. Ait. Hort. Kew. ed 2, III: 295. (1811). Jamestown (Bergman).

Family 46. **RANUNCULACEAE** L. Gerard, Fl. Gallopr p. 378. (1761).

RANUNCULUS Plinius XXV: 13. Tour. Els. p. 240. (1694).

442. *Ranunculus eremogenes* Greene, Erythaea 4: 121. (1896).

Ranunculus sceleratus eremogenes, Cockerell, Univ. Mo. Stud. Sci. II 2: 124. (1911).

Leeds, Oberon, Dunseith.

443. *Ranunculus eremogenes longissimus* Lunell in Am Midl. Nat. Vol. I. p. 206. (1910).

In coulée, Leeds. Became extinct, when the coulée dried up permanently.

444. *Ranunculus eremogenes pubescens* Lunell in Bull. Leeds Herb. no. 2, p. 6. (1908).

Leeds, Oberon.

445. *Ranunculus limosus* Nutt., T. & G. Fl. N. Am. I. p. 20. (1838).

Ranunculus Purshii Richards. var. *geranioides* Lunell in Bull. Leeds Herb. no. 2, p. 6. (1908).

Besides the type, the specimen in my herbarium is the only representative of Nuttall's plant known to be in existence.

Leeds (extinct).

446. *Ranunculus eremogenes* X *limosus*.

Ranunculus Purshii Richards. var. *dissectus* Lunell in Bull. Leeds Herb. no. 2, p. 6. (1908).

Leeds (extinct).

447. *Ranunculus Purshii* Richards. var. *polymorphus* Lunell in Bull. Leeds Herb. 1. c.

Peninsula of Lake Ibsen (extinct).

448. *Ranunculus Purshii* Richards. var. *schizanthus* Lunell in Bull. Leeds Herb. 1. c.

Leeds (extinct).

449. *Ranunculus Purshii* Richards. var. *humifusus* Lunell, nomen novum.

Ranunculus Purshii Richards. var. *radicans* Lunell in Bull. Leeds Herb. 1. c.

Ranunculus radicans Regel, Bull. Soc. Nat. Mosc. XXXIV pt. 2, 44. 45, not of C. A. Meyer & Ledeb.

Leeds (extinct), Peninsula of Lake Ibsen (extinct).

450. *Ranunculus delphinifolius* Torr.: Eaton, Man. ed. 2. 395. (1818).

Ranunculus multifidus Pursh, Fl. Am. Sept. 736. (1814), not Forsk. (1775).

Fargo (Bergman).

451. *Ranunculus abortivus* Linn. Sp. Pl. 551. (1753).

Leeds, Towner, Devils Lake.

452. *Ranunculus abortivus eucyclus* Fernald.

Devils Lake.

453. *Ranunculus pennsylvanicus* Linn. fil. Suppl. p. 272. (1781).

Leeds, Peninsula of Lake Ibsen, Turtle Mountains; Kulm (Brenckle).

454. *Ranunculus Macounii* Britton, Trans. N. Y. Acad. 12: 3. (1892).

Ranunculus hispidus Hook. Fl. Bor. Am. I: 19. (1829), not Michx. (1803).

Leeds, Minnewaukan.

455. *Ranunculus Macounii* X *pennsylvanicus*.

Devils Lake.

456. *Ranunculus acer* Linn. Sp. Pl. 554. (1753), cor. Host.

Ranunculus acris Linn. l. c.

Max in McLean County (O. A. Stevens).

457. *Ranunculus ovalis* Raf. Proc. Dec. 36. (1814).

Ranunculus rhomboides Goldie, Edinb. Phil. Journ. 6. 329. (1822).

Leeds, Butte, Dunsieith, Towner.

458. *Ranunculus Waldronii* Lunell in Am. Midl. Nat. Vol. III, p. 12 and 13. (1913).

Dickinson (Cl. Waldron).

BATRACHIUM S. F. Gray, Nat. Arr. Br. Pl. II: 720. (1821).

459. *Batrachium circinatum* (Sibth.) Rehb., Spach. Hist. Veg. VII, p. 201. (1839).

Ranunculus circinatus Sibth.; J. E. Smith, Fl. Brit. 2: 596. (1800).

Leeds, Devils Lake; Valley City (O. A. Stevens).

460. *Batrachium circinatum terrestre* Lunell.

A form growing on low land where water once was, but later dried up.

Leeds.

HALERPESTES Greene, Pitt. IV, 207 (1900)

461. *Halerpestes Cymbalaria* (Pursh) Greene, in Pittonia 4: 208. (1900).

Ranunculus Cymbalaria Pursh. Fl. Amer. Sept. 392. (1814).

Oxygraphis Cymbalaria Prantl. in Engl. & Prantl, Pflanzenfamilien, 32: 63. (1891).

Leeds, Devils Lake.

AIOLON Lunell, nom. nov. (gr. *Αἰολος*, Aeolus, the God of the winds).

Nemorosa Rupprecht, Fl. Jenensis, p. 128. (1726). (1718). This word means woody, sylvan, and is a plain adjective, not substantive. Furthermore, the name is misleading as far as our State is concerned, our species belonging to the prairie. These

have been considered good reasons for the change of genus name.

462. **Aiolon canadense** (Linn.) Nwd. & Lll.

Nemorosa canadensis (Linn.) Nwd. in Am. Midl. Nat. Vol. III, p. 322. (1914).

Anemone canadensis Linn. Syst. Ec 12. III. App. p. 231. (1768). *Anemone pennsylvanica* Linn. Mant. II. 247. (1771).

Leeds, Pleasant Lake, Towner; Kulm (Brenckle).

463. **Aiolon canadense flavum** Lunell, forma nova.

Petalis parvis, flavis. Planta rara.

A sporadic form with small, yellow petals.

Church's Ferry.

ANEMONE Theophrastus; Tour. Els. 238. (1694).

464. **Anemone Hudsoniana** Richardson. Franklin's 1st Journey ed. II, App. 22.

Butte (very rare).

465. **Anemone virginiana** Linn. Sp. Pl. 540. (1753).

Devils Lake, Dunsieith, St. John.

466. **Anemone cylindrica** A. Gray. Ann. Lyc. 3: 221. (1836).

Leeds, Butte, York, Pleasant Lake.

PULSATILLA Adanson, Fam. Pl. 2: 460. (1763).

467. **Pulsatilla hirsutissima** (Pursh) Britton, Ann. N. Y. Acad. 6: 217. (1891).

Clematis hirsutissima Pursh. Fl. Am. Sept. 385. (1814).

Pulsatilla Ludoviciana (Nutt.) Heller (?).

Anemone Nuttalliana DC. Reg. Veg. Syst. I: 193. (1818).

The flowers are of two kinds: 1. Those appearing before the leaves in the earliest spring, with *bright* sepals of many different shades. Common. 2. Those appearing with or after the leaves during the whole summer, but only sporadically, with sepals of a *pale* or faded, white or whitish color. Leeds, Butte.

CLEMATIS Dioscorides IV: 182. Plinius XXII: 10.

468. **Clematis virginiana** Linn., Amoen. Acad. 4: 275. (1759).

Fargo (Bergman & Stevens).

MYOSORUS Linn. Sp. Pl. 284. (1753).

469. **Myosurus minimus** Linn. l. c.

Dickinson (Cl. Waldron).

Family 44. **THALICTRACEAE** Greene, Leaflets II: 49. (1910).

LEUCOCOMA (Greene) Nwd. in Am. Midl. Nat. III. p. 253. (1914).

470. **Leucocoma albens** (Greene). Lunell.

Thalictrum albens Greene, in Am. Midl. Nat. Vol. II, p. 292. (1912).

Valhalla (L. R. Waldron).

471. **Leucocoma Lunellii** (Greene) Lunell.

Thalictrum Lunellii Greene in Am. Midl. Nat. Vol. I, p. 102. (1909).

Minot, Towner.

472. **Leucocoma thyrsoides** (Greene) Lunell.

Thalictrum thyrsoides Greene in Am. Midl. Nat. Vol. I, p. 102. (1909).

Leeds, Butte, Dunsieith.

473. **Leucocoma thyrsoides silvana** Lunell.

Thalictrum thyrsoides silvanum Lunell, in Am. Midl. Nat. Vol. II, p. 157. (1911).

Peninsula of Lake Ibsen, Devils Lake, Pleasant Lake, Towner, Turtle Mountains.

474. **Leucocoma vegeta** (Greene) Lunell.

Thalictrum vegetum Greene in Am. Midl. Nat. Vol. I, p. 103. (1909).

Devils Lake, Peninsula of Lake Ibsen, Turtle Mountains, Towner, Minot, Pleasant Lake.

Family 45. **HELLEBORACEAE** Loiseleur-Delongchamps, Man. Pl. Us. (1819).

AQUILEGIA Fuchs. Hist. Stirp. p. 39. (1546).

475. **Aquilegia canadensis** (Cornuti) Linn. Sp. Pl. 534. (1753). Turtle Mountains.

POPULAGO Tabernaemontanus, Neeuw. Kreuterb. p. 118. (1590). Tour. Els. p. 238. (1694). Moench. Meth. p. 250. (1794). *Caltha* Linn., not of the older botanists, which is = *Calendula*.

476. **Populago palustris** (Linn.) Moench. l. c.

Caltha palustris Linn. Sp. Pl. 588. (1753).

Sheyenne, Pleasant Lake, Granville.

PLECTRORNIS, Raf., Med. Fl. II, 216 (1830).

(An nomen nudum?)

Delphinastrum Spach, Hist. Nat. Veg. VII, p. 336 (1839) not desirable as built on another plant name.

477. **Plectronis albescens** (Rydb.) Lunell.

Delphinium albescens Rydb. Bull. Torr. Cl. 583 (1899).

Walupaton (W. B. Bell) Fargo (Cl. Waldron).

478. **Plectornis bicolor montanense** (Rydb.) Lunell.

Delphinium bicolor montanense Rydb. Fl. Mont. p. 157 (1900).

Medora (Cl. Waldron).

Delphinium (Discorides) Linn. Sp. Pl. 536 (1753). *Sensu stricto* with type, *D. peregrinum* Linn. l. c. is found in European Mediterranean region. *Consolida* Brunfels, Herb. Viv. Ic. 84c (1532) has no species known in this State except perhaps *C. Ajacis* (Linn). Nwd. and only under cultivation.

CHRISTOPHORIANA Gesner. Hort. Ger. p. 253. (1561).

Actaea Linn. Syst. (1737), but not *Actaea* Plinius XXVII: 7, 26, which is *Sambucus Ebulus* Linn.

479. **Christophoriana arguta** (Nutt.) Lunell.

Actaea arguta Nutt.; T & G. Fl. I: 35. (1838).

Devil's Lake, Pleasant Lake, Dunsieith, St. John.

480. **Christophoriana arguta alabastrina** Lunell.

Actaea arguta alabastrina Lunell, in Am. Midl. Nat. Vol. II. p. 123. (1911).

Among the species in all the localities just mentioned.

Family 46. **PODOPHYLLEAE** D. C. Syst. II. p. 31. 32. (1821).

CAULOPHYLLUM L. C. Richard in Michx. Fl. Bor. Am. I: 204. (1803).

481. **Caulophyllum thalictroides** (Linn.) L. C. Rich. l. c.

Leontice thalictroides Linn. Sp. Pl. 312. (1753).

Cass County: Fargo.

Family 47. **BERBERIDEAE** Vent., Tab. III. p. 83. (1799).

BERBERIS Cuba, Hort. Sanit. (15th Cent.), also Jacob de Manliis in Brunfels, Herb. Viv. Ic. p. 174. (1531).

482. **Berberis vulgaris** Bellonius, Cult. (1553), also Clusius: Linn. Sp. Pl. 330. (1753).

Originally cultivated. Leeds.

Family 48. **MENISPERMACEAE** DC., Prod. I. p. 85. (1824).

MENISPERMUM Tour., Acad. Reg. 237. (1705), also Dill., Gen. p. 150. (1719). Linn. Syst. (1735). Gen. (1757 and 1754).

483. **Menispermum canadense** Linn. Sp. Pl. 34. (1753).

Seemingly always sterile. Pleasant Lake, Towner.

Order 23. RHOEDALES.

*Barbling, Ord. Nat. Pl. p. 254. (1831).*Family 49. **PAPAVERACEAE** B. Jussieu, Hort. Trian.,

A. Jussieu, Gen. (1789).

Papaver Virgilius Georg. I. 212, IV. 131, 545. Aen. I: 78.484. **Papaver cereale** Virgilius l. c., Columella X, 314.*Papaver rhoeas* Lobelius, Gerard, Dodonaeus (1557).

An escape from gardens, Leeds.

485. **Papaver somniferum** Virgilius, Aen. IV: 131.**PAPAVER SOMNIFERUM** Linn. Sp. Pl. 508. (1753).

Subspontaneous. Leeds.

BELHARNOSIA Sarracen ex Adanson Fam. p. 43. (1763).*Sanguinaria* Dillenius (1732), Linn., not Plinius nor Tragus =*Panicum sanguinale* Linn.486. **Belharnosia mesochora** (Greene) Lunell.*Sanguinaria mesochora* Greene, in Pittonia Vol. V, p. 308

(1905).

St. John (perhaps distinct); Fargo (Bergman).

Family 50. **FUMARIACEAE** D. C. Syst. II, p. 105. (1821).Subfamily *Fumariaceae*.**CAPNORCHIS** Boerhave, Index. Alter. Planter I: 309. (1727).*Bicuculla* Adanson, Fam. Pl. II: App. 23. (1763).487. **Capnorchis formosa** (D. C.) Lunell.*Bicuculla formosa* (DC.) Howell.

Subspontaneous. Leeds.

Subfamily *Corydalleae*.**CORYDALIS** Castor Durante (1585) Vent. Choix. 19.

(1803), also Medicus, Phil. Bot. 96. (1789).

Capnoides Tour. Els. p. 335. (1695), I. R. H. p. 423. (1700),

Adanson, Fam. Pl. p. 431. (1763).

488. **Corydalis aurea** Willd. Enum. Pl. 740. (1809).*Capnoides aurum* (Willd.) Kuntze. Rev. Gen. Pl. I: 14. (1891).

Peninsula of Lake Ibsen, Turtle Mountains.

Family 51. **SILIQUOSAE** Linn. Phil. Bot. 34. (1751).

Also Ray, Meth. Pl. 119. (1681).

Cruciferae B. Jussieu, Hort. Trianon (1759).**TOMOSTIMA** Raf., Neogenyton 2. (1825).*Drabella* Bubani, Fl. Pyr. III. 197. (1901) in part.*Draba* Linn. in part, not Dioscorides = *Lepidium Draba* Linn.

489. **Tomostima micranthum** (Nutt.) Lunell.
Draba micrantha Nutt.; T. & G. Fl. N. A. I: 109. (1838).
Draba caroliniana micrantha (Nutt.) A. Gray, Man. Ed. 5.
 72. (1867).
 Minot; Medora (Cl. Waldron).
 490. **Tomostima luteum** (Gilb.) Lunell.
Draba lutea Gilib., acc. to DC. Syst. II: 35.
Draba nemorosa Linn., var. *leiocarpa* Lindbl.
 Leeds, Peninsula of Lake Ibsen.
 491. **Tomostima nemorosum** (Linn.) Lunell.
Draba nemorosa Linn. Sp. Pl. 643. (1753).
 Towner.
THLASPI Dioscorides 2, 147 (Ruellius' ed.) 189. (1547).
 Linn. Syst. (1735). Gen. 193 (1737), 242 (1754). Ray I: 838.
 Gesner. Hort. 284. (1561).
 492. **Thlaspi fatuum** Gesner, Hort, Germ. (1561): also Ray l.c.
Thlaspi Bursa pastoris Linn. Sp. Pl. 647. (1753).
Bursa pastoris Weber, Wigg. Prim. Fl. Holsat. 47. (1780).
Capsella pastoralis Dulac. Fl. Pyr. 189. (1867).
Capsella Bursa-pastoris Medic. Pflanzengatt. I: 85. (1792).
 Leeds, and everywhere else.
TERUNCIOUS Lunell, nomen novum (lat. **teruncius**, a small coin, the shape of the fruit suggesting the likeness. Cfr. also the English name Penny Cress).
Thlaspi Dill., not Diosc. *Thlaspidium* Tragus, Hist. Stirp. 85. (1552), Spach (1838), Adanson (1762) = *Biscutella*, *Thlaspidica* Opiz (1852), all unacceptable names, as built on *Thlaspi*. *Pachyphragma* (= *Thlaspi latifolium* Linn.), used by DC. in Prodr. I. 175 as a section, from which Reichenbach in Nom. 179. (1841) probably got it. *Nomisma* DC., antedated by *Nomisma* Wright & Arn (= *Rhynchosia*).
 493. **Teruncius arvensis** (Linn.) Lunell,
Thlaspi arvense Linn. Sp. Pl. 646. (1753).
 Leeds, and everywhere.
RORIPA Scopoli, Fl. Carn. 520. (1760).
Radicula Dillenius, Cat. Pl. Giss. 80. (1718), in part. Hill, Br. Herbal. 265 (1756), not Dodonaeus Pempt. 666 (1583) = *Raphanus*.—*Nasturtium* R. Br. in Ait. Hort. Kew. Ed. 2, 4: 109. (1812), in part.
 494. **Roripa palustris** (Linn.) Besser, Enum. 27. (1821).

- Sisymbrium amphibium* var. *palustre* Linn. Sp. Pl. 657. (1753).
Nasturtium terrestre R. Br. in Ait. Hotr. Kew. Ed. 2. 4: 112. (1812).
Nasturtium palustre DC. Syst. 2: 191. (1821).
Radicula terrestris (R. Br.) Woot. & Standley, Contr. U. S. Nat. Herb. Vol. 19. 284. (1915).
 Leeds; Kulm (Brenckle).
 495. **Roripa hispida** (Desv.) Britton in Mem. Torr. Bot. Club 5: 169. (1894).
Brachylöbus hispidus Desv. Journ. de Bot. 3: 183. (1814).
Nasturtium hispidum DC. Reg. Veg. Syst. 2: 201. (1821).
Radicula hispida (Desv.) Britt. Torreyia VI: 32. (1908).
 Leeds, Peninsula of Lake Ibsen, Oberon.
 496. **Roripa hispida** var. *glabrata* Lunell in Bull. Leeds Herb. no. 2, p. 6. (1908).
Roripa terrestris var. *globosa* Aven Nelson in Bot. Gaz. 52: p. 264. (1911).
 Leeds.
 497. **Roripa sinuata** (Nutt.) Hitchc. Spr. Fl. Manhattan 18. (1894).
Nasturtium sinuatum Nutt.; T. & G. Fl. N. Am. I: 73. (1838).
Radicula sinuata (Nutt.) Greene, Leaflets I: 113. (1905).
 Dickinson (Bergman).
Armoracia Plinius XIX: 5. Columella, Heucher, Rivinus, Ruppius, Gaertner. *Cochlearia* Tour. Els. 183. (1684).
 498. **Armoracia Rivini** Ruppius Fl. Jen. 67. (1726).
Roripa Armoracia (Linn.) A. S. Hitchc. l. c. (1894).
 Thoroughly established. Leeds.
LESQUERELLA S. Wats. Proc. Am. Acad. 23: 249. (1888).
 499. **Lesquerella argentea** (Pursh) Mac M. Met. Minn. 263. (1892).
Myagrurn argenteum Pursh Fl. Am. Sept. 434. (1814).
Vesicaria argentea DC. Syst. 2: 297. (1821).
Lesquerella Ludoviciana S. Wats. l. c. 252. (1888).
 Dickinson (Bergman).
 500. **Lesquerella alpina** (Nutt.) Wats. l. c. 251. (1888).
Lesquerella spathulata Rydb., Contr. U. S. Nat. Herb. 486. (1896).
 Beach (Bergman).
 501. **Lesquerella Lunellii** A. Nels. Bot. Gaz. 42: 49. (1906).

Leeds, Butte.

502. *Lesquerella Lunellii lutea* A. Nels. Bot. Gaz. 54: 149. (1912).

Pleasant lake, Dunsieith, Towner, Minot, Williston.

PHYSARIA A. Gray, Gen. Ill. x: 162. (1848).

503. *Physaria didymocarpa* (Hook.) A. Gray, l. c.

Vesicaria didymocarpa Hooker, Fl. Bor. Am. I: 49. pl. 16. (1830).

Medora (Bergman).

BIAURICULA Bubani, Fl. Pyr. III. 207. (1901).

Iberis Dillenius Gen. 6. (1719). Linn. Syst. (1735). also Gen. Pl. 192. (1737), 292. (1754. not Diosc.

The *Iberis* Dioscorides is an entirely different plant. Adanson (Fam. Pl. 2, p. 422. (1763) called the Linnaean Genus *Iberis* by the name *Arabis* Dod. Dodonaeus did not even give this name exclusively to plants of this genus. *Iberis* Democritus is *Lepidium Iberis* Linn. Sp. Pl. 645. (1753). In any case the *Iberis* (Dill.) Linn is inapplicable.

(To be continued.)

THE STORY OF OUR BIRDS THROUGHOUT THE YEAR 1915.¹

BY BROTHER ALPHONSUS, C. S. C.

It affords me great pleasure to have the honor to address the members of the Chicago Ornithological Society. The regularity with which this society holds its meetings, and the methodical way in which its members study bird life are evident tokens of the vitality of the association. It seems to me that such manifest enthusiasm for so delightful a pursuit as ornithology should awaken a similar interest in many others. Indeed it seems to me that the influence of those who are so fortunate as to be admitted to this society should create a wide-spread desire to share the advantages they possess. Why should the Chicago Ornithological Society not feel that it has a great mission to the people of this city—to be instrumental in promoting a knowledge of

¹ A paper read before the Chicago Ornithological Society on Tuesday Evening, January 4, 1916.

bird life among old and young. Their prestige as ornithologists should easily fit the members of this society for such a mission.

In what way may this mission be best fulfilled? Undoubtedly I think the most effective way of achieving this praiseworthy object is to try to arouse not only interest, but even enthusiasm, for the study of ornithology among the teachers of our schools. Without doubt we can succeed in awakening both interest and enthusiasm for this branch of study in a body of men and women to whom the ideals of life make an especially strong appeal. And among the ideals that should enlist the devotion of every refined person is the visible expression of the beautiful in the life of our native birds. To make the acquaintance of the feathered denizen of our fields and forests is to be made like them—happy the live-long day.

Here then is the great mission for the Chicago Ornithological Society. Why should its members not take the initiative in every thing that can promote the study of birds among the teachers of our schools? By lectures the members can show the importance of this branch both from an economic and an aesthetic standpoint. By leading expeditions out into the country these naturalists can create a genuine enthusiasm for the study of the living bird in its native haunts. And after all, the chief object of all our efforts lies in this one point—to arouse enthusiasm. If we succeed in this, all else must be successful.

It may not be amiss to give you my own experience in doing what I could to create both interest and enthusiasm in the study of our birds. Besides what I may have done toward this object by the publication of my articles on bird life in *THE AMERICAN MIDLAND NATURALIST*, I had last autumn the opportunity of guiding the teachers of the South Bend Training School in their study of ornithology. Every Thursday afternoon I met the young ladies of this institution at 4 p. m., and led them through fields and groves on the banks of St. Joseph River. These trips continued until the weather grew unfavorable for further observations. Next April we propose to resume our study, and hope to do much better work, for spring is always more suitable than autumn for finding a great abundance of bird life.

So far what I have said to you is mostly by way of suggestion. Men of experience know the value of wise suggestion and always welcome it. If I may offer advice at any time to the members

of the Chicago Ornithological Society it will be gladly given. We who are devoted to the study of ornithology should feel that we are in truth members of a fraternity, and should be desirous of helping one another as best we may. Encouragement is probably the most helpful thing we can give; so let us give it gladly.

I shall now do my best to relate to you the story of our birds as their lives were revealed to me throughout the year, 1915. And what a fascinating story it was. Daily did I watch the movements and the habits of the many species of birds that passed or stayed near my Indiana home. Through bleak winter and balmy spring, through sweet summer and serene autumn, the birds are always with us. To become acquainted with them is to love them. They are truly friends, for which we may feel affection.

In winter the Snowbirds fly before us darting at one another; the Blue Jay displays his beautiful coat as he passes from tree to tree; flocks of Crows are started in fields or woods, and their distant cawing is characteristic at this season; Tree Sparrows, Nuthatches, Chickadees and Brown Creepers may be seen not unfrequently on winter days. In March the first notes of the Song Sparrow and the Bluebird are the joy of the bird-lover; the first Robin is noted by every man and child; the loud whistle of the Meadowlark rings in our fields; Blackbirds appear, and are not unwelcome; April and May follow, when bird life reaches its climax, and then begins to recede. The month of June finds most of the birds rearing their first brood; in July families of birds are found feeding; in August nearly all the singing ceases, and the autumn migration begins. By September the migration is in full swing, and many species not seen since spring reappear; October is much like September, but seldom gives the diligent observer more than 50 species; November marks the close of the autumn migration, hardly ever affording as many as 25 species. With the advent of December, our feathered friends are so few that most people think there are none to be found.

Our story starts in December, 1914, in which the following species were found: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Screech Owl, Brown Creeper, Tree Sparrow, Snowbird, Pine Grosbeak, Chickadee, and Vesper Sparrow. The total number of species seen was 14.

The species that were most abundant in December were the Crow, found on 22 days; the Blue Jay, with 29 records; the White-breasted Nuthatch, seen on 21 days; the Red-headed Woodpecker, recorded on 25 days. Species that were less abundant were the Downy Woodpecker, with 12 records; the Brown Creeper, with 10; the Snowbird, with 7. The least abundant species were the Tree Sparrow, recorded 4 times; the Song Sparrow, 7 times; the Vesper Sparrow, once—on the 25th—the only winter record I have ever made of this species; the Goldfinch, 5 times; the Screech Owl, the Pine Grosbeak, the Chickadee, the Hairy Woodpecker, each recorded once.

The Pine Grosbeak was found on Dec. 4th in a mulberry tree just in the rear of Corby Hall at Notre Dame. A number of English Sparrows were curiously watching the bird. Other records of this species were made on October 22, and November 6, 1914. On the October date a pair of these Grosbeaks was seen. The male was reddish on the head and back; the female, mottled with brownish and lighter; the call-note is distinctive.

The Vesper Sparrow, recorded on Dec. 25, was flying in a row of maple trees, and out on the snow, where some weeds stood higher than the snow. Here the bird ate some of the seeds of the weeds. The peculiar flight of this species make its identity certain to the trained observer.

The Song Sparrows, found in December, were always near one of the lakes at Notre Dame. Sometimes the bird's call-note was heard from a small island in a frozen lake; but most frequently the Song Sparrow was heard or seen near an open runway leading to an ice-house. Usually the observer hears this sparrow's call-note before seeing the bird; when silent its identification may be known by the bird's peculiar flight.

In January, 1915, the species seen were: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Screech Owl, Brown Creeper, Tree Sparrow, Snowbird, Chickadee, Hairy Woodpecker, Cardinal. The total number of species seen was 14.

In this month the Blue Jay had 29 records; the Crow had 22; the White-breasted Nuthatch had 20; the Brown Creeper had 18; the Snowbird had 17; the Red-headed Woodpecker and the Tree Sparrow had 14. Species having fewer records were: Downy Woodpecker, seen on 9 days; the Chickadee and Cardinal,

found on 3 days; the Song Sparrow and Goldfinch, observed twice; the Screech Owl and Hairy Woodpecker, each with a single record.

In the winter months the habits of the Brown Creeper may be studied to advantage. Among these the creeping of the bird is most interesting. Usually it will fly to the base of a tree, and begin to ascend on one side—sometimes going almost to the top without deviating but a few inches in its course. Then it may fly down again to the base of the same tree and ascend on the opposite side. At other times the bird is quite irregular in its method of ascending. A very faint call-note will attract the attention of the observer, who depends on this to be made aware of the bird's presence. I once saw a Brown Creeper go up the two-story side of a brick house to the roof, the bird losing its hold twice.

The species seen in February, 1915 were: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Brown Creeper, Tree Sparrow, Snowbird, Chickadee, Cardinal, Bluebird, Robin, Killdeer, Herring Gull. The total number of species seen was 16, and total for the three winter months was 20, the largest record I have yet made.

As in January, the Blue Jay has most records in February—24; the Crow came next, with 23. The Brown Creeper had 12 records; the Snowbird had 9; the White-breasted Nuthatch and the Red-headed Woodpecker each had 6; the Song Sparrow had 7; the Tree Sparrow had 11; the Robin had 8. Species with very few records were: Bluebird, with 3; Cardinal, and Herring Gull, with 2; Killdeer, Chickadee, and Goldfinch, with one.

February of this year, after the 12th, proved an unusually interesting month to the bird-lover. Robins and Bluebirds appeared on the 13th, which was a warm, bright day, and the notes of both species were heard. On the 20th the songs of the Bluebird and Song Sparrow were heard. On this day I also heard, for the first time in all my observations, the song of the Brown Creeper, which was low and rapid and pleasing. By the 21st of the month Song Sparrows were singing continuously—something I do not remember hearing so early ever before.

The winter of 1914-15 showed an increase in the distribution of the Crow, Blue Jay, Brown Creeper, and Song Sparrow; a decrease, for the White-breasted Nuthatch, Red-headed Wood-

pecker, Downy Woodpecker, Snowbird, Tree Sparrow, and Chickadee. Three species seen last winter, but not this, were: Bronzed Grackle, Meadowlark, and Snowflake.

The March records for 1915 totalled 19, which was 11 fewer than those of 1914. The eleven species not found March, 1915 were: White-breasted Nuthatch, Goldfinch, Screech Owl, Chickadee, Hairy Woodpecker, Cardinal, Snowflake, Sparrow Hawk, Purple Finch, Sapsucker, Phoebe.

The latest record in February for the White-breasted Nuthatch was the 27th; no record occurred in April; the bird reappeared on the 1st of May, and disappeared until June 20th. Barring the one May record, we have the unprecedentedly long absence of 111 days. The spring migration of this species has always been exceedingly interesting to me, but I am at a loss to know what can be the determining cause of its withdrawal as spring approaches.

Another species that is irregularly seen in winter and early spring is the Goldfinch. This year the only record in February was on the 23d. After this date the species failed to appear until April 13th—an absence of 48 days. Who can explain this irregularity?

The species recorded in March, 1915 were: Crow, Blue Jay, Red-headed Woodpecker, Downy Woodpecker, Song Sparrow, Brown Creeper, Tree Sparrow, Snowbird, Meadowlark, Bluebird, Robin, Killdeer, Herring Gull, Canada Goose, Red-winged Blackbird, Bronzed Grackle, Flicker, Kingfisher, Cowbird.

The most abundant species in March were: Crow, Blue Jay, Snowbird, Meadowlark, Bluebird, Robin, Red-winged Blackbird, and Bronzed Grackle. Less abundant species were: Downy Woodpecker, with 5 records; Herring Gull, with 6; Tree Sparrow, with 9; Red-headed Woodpecker and Killdeer with 13. The least abundant species were: Brown Creeper, Canada Goose, Flicker, Kingfisher, and Cowbird, each with one record.

Dates of migration in March were: Meadowlark on the 3d; Canada Goose, on the 9th; Red-winged Blackbird and Bronzed Grackle, on the 12th; Flicker, on the 19th; Kingfisher, on the 30th; Cowbird, on the 31st. Against these seven migrants there were 18, in March, 1914.

The following disjointed observations, made in March, 1915 may be of interest: March 3.—Mating song of Blue Jay was

heard—low and sweet.—March 5.—A snowstorm; only the Blue Jay was seen.—March 6.—Tree Sparrows numerous in a garden.—First jingling note of the Snowbird.—March 7.—First note of the Robin in this month.—March 14.—First loud calling-note of the Red-headed Woodpecker.—March 15.—Crows carrying food.—March 19.—First Red-headed Woodpecker out of woods; in winter this species is confined to woods.—First note of the Flicker.—March 20.—Herring Gull fishing in a small lake.—March 23.—Bluebirds, Robins, Meadowlarks, Red-winged Blackbirds, in full song.

The species seen in April were: Crow, Blue Jay, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Brown Creeper, Tree Sparrow, Snowbird, Chickadee, Meadowlark, Bluebird, Robin, Killdeer, Red-winged Blackbird, Bronzed Grackle, Flicker, Kingfisher, Cowbird, Field Sparrow, Fox Sparrow, Towhee, Phoebe, Sparrow Hawk, Mourning Dove, Vesper Sparrow, Sapsucker, Kingbird, Golden-crowned Kinglet, Hermit Thrush, Brown Thrasher, Chipping Sparrow, Ruby-crowned Kinglet, Chimney Swift, Myrtle Warbler, White-throated Sparrow, Spotted Sandpiper, House Wren, Baltimore Oriole, Warbling Vireo, Pine Warbler, Yellow Warbler, Catbird, Yellow Palm Warbler, Purple Martin, Bobolink. The total number of species seen was 47.

Species that had few records in April were: Brown Creeper, with 9; Spotted Sandpiper and House Wren, with 8; Downy, Woodpecker, Baltimore Oriole, Warbling Vireo, with 7; Sapsucker, with 6; Ruby-crowned Kinglet, Chimney Swift, with 5; Tree Sparrow, Hermit Thrush, White-throated Sparrow, with 4; Fox Sparrow, Pine Warbler, Catbird, Yellow Palm Warbler, Sparrow Hawk, with 2; Chickadee, Yellow Warbler, Kingbird, Purple Martin, Bobolink, with one.

The dates of migration in April were: Field Sparrow, on the 4th; Fox Sparrow, Towhee, Phoebe, Sparrow Hawk, Mourning Dove, on the 5th; Vesper Sparrow, on the 6th; Sapsucker, on the 7th; Golden-crowned Kinglet and Hermit Thrush, on the 9th; Brown Thrasher and Chipping Sparrow, on the 13th; Ruby-crowned Kinglet, Chimney Swift, Myrtle Warbler, on the 19th; White-throated Sparrow, on the 20th; Spotted Sandpiper, on the 21st; House Wren, on the 23d; Baltimore Oriole, Pine Warbler, on the 24th; Yellow Warbler, on the 26th; Catbird, Yellow Palm Warbler, Kingbird, on the 28th; Purple Martin, on the 29th;

Bobolink, on the 30th. The total number of migrants in April, 1915 was 26. For this month, in 1914, there were 28 migrants.

Some of the more notable of my observations in April, 1915 were the following: April 7, loud note of the Phoebe.—April 13, Goldfinches in summer plumage.—Field Sparrows in full song.—April 16, Mourning Doves building.—April 17, a Brown Thrasher singing for ten minutes in the afternoon.—April 19, Vesper Sparrow in full song.—April 23, one Snowbird on the ground in a cemetery; the last April record for this species was on the 26th.—April 30, Bobolink singing in a tree top at very brief intervals. I heard the song some distance away as I approached the bird. This was my earliest date for hearing the song of the Bobolink.

The species recorded in May, 1915 were: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Screech Owl, Snowbird, Meadowlark, Bluebird, Robin, Killdeer, Red-winged Blackbird, Bronzed Grackle, Flicker, Kingfisher, Cowbird, Field Sparrow, Towhee, Phoebe, Mourning Dove, Vesper Sparrow, Hermit Thrush, Blue-headed Vireo, Brown Thrasher, Chipping Sparrow, Ruby-crowned Kinglet, Chimney Swift, Myrtle Warbler, White-throated Sparrow, Spotted Sandpiper, House Wren, Baltimore Oriole, Warbling Vireo, Pine Warbler, Yellow Warbler, Catbird, Yellow Palm Warbler, Kingbird, Bobolink, Screech Owl, Water Thrush, Barn Swallow, Black-throated Green Warbler, Orchard Oriole, Crested Flycatcher, White-crowned Sparrow, Yellow-throated Vireo, Indigo Bird, Gnatcatcher, Blackburnian Warbler, Wood Pewee, Red-eyed Vireo, Dickcissel, Greater Yellowlegs, Yellow-billed Cuckoo, Alder Flycatcher, Cedarbird, Bay-breasted Warbler, Black-throated Blue Warbler, Cape May Warbler, Chestnut-sided Warbler, Magnolia Warbler, Prairie Warbler, Rose-breasted Grosbeak, Redstart, Owenbird, Black and White Warbler, Maryland Yellowthroat, Tennessee Warbler, Least Flycatcher, Scarlet Tanager, Lesser Yellowlegs, Bank Swallow, Mourning Warbler, Black-poll Warbler, Nighthawk, Canadian Warbler, Wilson Warbler. Whip-poor-will, Hummingbird. The total number of species seen was 83.

The rare species in May were: Bay-breasted Warbler, Ovenbird, with 9 records; Yellow Palm and Chestnut-sided Warblers, with 8; Yellow-billed Cuckoo, White-crowned Sparrow, with 7; Barn Swallow, Scarlet Tanager, with 6; Bluebird, Yellow-throated

Vireo, Black-throated Blue Warbler, Rose-breasted Grosbeak, Maryland Yellowthroat, Tennessee Warbler, Least Flycatcher, Black-poll Warbler, Nighthawk, with 5; Towhee, Magnolia Warbler, Black and White Warbler, with 4; Blue-headed Vireo, Alder Flycatcher, Hummingbird, 3; Snowbird, Pine Warbler, with 2; White-breasted Nuthatch, Downy Woodpecker, Screech Owl, Ruby-crowned Kinglet, Water Thrush, Gnatcatcher, Greater and Lesser Yellowlegs, Cedarbird, Cape May Prairie, Mourning, Canadian, Wilson, Warblers, Whip-poor-will, with one record.

The May migrants were: Downy Woodpecker, departed on the 29th; Hermit Thrush, departed on the 31st; Ruby-crowned Kinglet, departed on the 10th; Myrtle Warbler, departed on the 20th; White-throated Sparrow, departed on the 23d; Yellow Palm Warbler, departed on the 22d; Black-throated Green Warbler arrived on the 5th and departed on the 24th; White-crowned Sparrow, arrived on the 9th and departed on the 21st; Indigo Bird and Gnatcatcher, arrived on the 10th; Blackburnian Warbler, Wood Pewee, Red-eyed Vireo, arrived on the 11th; Dickcissel and Greater Yellowlegs arrived on the 12th; Yellow-billed Cuckoo, arrived on the 13th; Alder Flycatcher and Cedarbird, arrived on the 14th; Bay-breasted, Black-throated Blue, Cape May, Chestnut-sided, Magnolia, Prairie Warblers, Rose-breasted Grosbeak, Redstart, Ovenbird, arrived on the 15th; Black and White Warbler, Maryland Yellowthroat, Tennessee Warbler, arrived on the 16th; Least Flycatcher, Scarlet Tanager, Lesser Yellowlegs, arrived on the 17th; Mourning and Black-poll Warblers, Nighthawk, arrived on the 19th; Canadian Warbler, arrived on the 21st; Wilson Warbler, on the 22nd; Whip-poor-will, on the 23; Hummingbird, on the 25th.

Conclusion next number.

CRITICAL NOTES OF NEW AND OLD GENERA OF PLANTS.—VII.

BY J. A. NIEUWLAND.

NUMMULARIA.

The mycologists in a number of instances seem to have been unfortunate in selecting a considerable number of hitherto uncorrected names which are invalidated by previous use. In the

time of Linnaeus it was considered wrong to have animals and plants with identical names. The later botanical codes have asserted independence from zoological nomenclature by accepting names already used for animals. None, however, dare go so far in encouraging confusion as to admit the same names in the different plant groups. Such breaches of a logical fundamental tenet have unwittingly been quite numerous. The pardoning circumstance if any has been that mycological nomenclature has not been as carefully classified as that of the higher plants. In enquiring about *Nummularia* one would be perhaps nonplussed to ask whether the fungus or the primulaceous plant was meant. Mycologists have no right to take even temporarily rejected names of higher plants and apply them to such of their phyla. This practice arises perhaps from poverty of knowledge of classical languages or inability to make good names entirely new. If, however, a botanist considers a group of plants dignified enough to receive a generic caption he should, we take it, think the matter serious enough to endow it not only with a valid name, but with at least not a stupid one. Making a new genus by giving it a diminutive ending *ella*, *ula* or *iola* particularly when the first plant was named after some botanist is a ridiculous practice showing either ignorance or lack of seriousness on the part of the nomenclator, either or both of which make the systematic botanists justly appear ridiculous to other men of science, nor will such a practice be tolerated by a more careful and discriminating future.

The name *Nummularia* was used by the older botanists of the eighteenth century or earlier, and since 1753 for a plant segregated from the genus *Lysimachia* by S. F. Gray also, i. e., *Lysimachia Nummularia* Linn. To avoid confusion its use applied subsequently for a fungus is invalid. For the latter is suggested the name *Kommamyce*.

Kommamyce, Nom. Nov.

Nummularia Tul. 8 (1861-1865) not *Nummularia* S. F. Gray, Nat. Arr. Br. Pl. II. 300 (1821) Tulasne, L. R. & C., Sel. Fung. II. (1861-1865).

Among other species we have:

Kommamyce Bulliardi (Tul).

Nummularia Bulliardi Tul.

Kommamyce lateritia (Ell. & Ev.).

Nummularia lateritia Ell. & Ev.

Among the more important names of fungi that have been antedated by use for other plants the following may be mentioned. The name *Asteridium* Sacc. is peculiarly unfortunate. Not only was there an earlier *Asteridium* Englem¹ but also an *Asteridea* Lindley, (1839). The name is but a Greek diminutive of *Aster*, and the oldest of them is at most, but a poor makeshift. There are beside an *Asterias*, several *Asteriscus*, an *Asteropsis*, *Asterioides*, and in the same family, an *Asteronia*, *Asterella*, and *Asterina*(!) all of these based on the same word with nothing but a suffix appended to give slight difference in form.

Moreover all of these are but Greek forms of *Stellaria*. To replace the untenable fungus name *Asteridium* may be suggested that of *Arberia* in honor of Agnes Arber who wrote a valuable and learned work of erudition on Herbals, their Origin and Evolution.

Arberia Nom. Nov.

Asteridium Sacc. I: 49 not *Asteridium* Englem. l. c. (1843).

Arberia juniperina (Cke).

Asteridium juniperinum (Cke).

Arberia lepidigenoides (Ell. & Ev.).

Asteridium lepidigenoides (Ell & Ev.).

BELONIA.

Still another example quite if not more inexcusable is the fact that the mycologists have permitted the name *Belonia*, whereas even Linnaeus² himself had a genus *Bellonia*! Moreover should one be tempted to quibble about the spelling of the word i. e., with one l instead of two, Adanson³ had the Linnaean name *Bellonia* spelled with one l. Besides this the name *Belonium* with a different gender ending, is used as a name of another fungus making the chance for confusion, even if possible, still worse. When we remember that there is a *Belonidium* (Greek diminutive form) and a *Belloniella* (Latin, diminutive form) as also a *Belonopsis*, we are tempted to wonder whether the condition could be made even more ridiculous, by dedicating *all* the genera in the group to one botanist, and put numerals after them to distinguish them as they did the kings and emperors of old and no.

To replace the fungus name *Belonia* we suggest *Pradalia*

¹ Walpers, Rep. II. 958 (1843).

² Linnaeus C., Sp. Pl. 172 (1753).

³ Adanson, M., Fam. II. 158 (1763).

after E. Pradal¹ author of a work on Cryptogams of France. The *Belonium* Sacc. has no more reason for existence than the other, but there certainly can not be two such names in one branch of plants unless the subject of mycological nomenclature is to be made or remain a ridiculous matter, deliberately tolerated by men of science.

CATHARINEA.

Saccardo's *Catharinea*² is untenable because of the moss plant name so called by Ehrhart.³ The name *Hyalospora* is apparently suitable and significant particularly in the case of the American species.

Hyalospora Nom. Nov.

Catharinea Sacc., and of the mycologists not *Catharinea* Ehrh. (1787) l. c. (which is a moss).

Hyalospora americana Comb. Nov.

Catharinea hyalospora Ell. & Ev.

DARLUCA Cast.

There was a *Darluca* Raf. (1820)⁴ that rendered the fungus name preoccupied. It seems therefore necessary to replace the latter by another in **Kabathia**. Herman Kabath⁵ after whom we name it, was the author of a work on the flora of Gleiwitz.

Kabathia Nom. Nov.

Darluca Cast. (1842) not *Darluca* Raf. (1820) = *Faramea* of the *Rubiaceae*.

Kabathia interseminata (Wint.) Nov. Com.

Darluca interseminata Wint.

Kabathia Filum (Biv.) Nov. Comb.

Darluca Filum (Biv.) Cast.

GAUTIERA Vittadini (1831)

The name of *Gautiera* Vittadini,⁶ also written *Gautieria* is but another form of the Linnaean *Gaultheria*. It is, however,

¹ Pradal E., Cat. Plantes Crypt. Loire Infer.

² Spelled by some *Catharinia* the name is no better because the spoken word is the one that obviously must concern us in question of homonyms as it is this that is the source of confusion rather than a written one.

³ Ehrhart F., Beitrage, 1, p. 190 (1787).

⁴ Rafinesque, C. S. Am. Jr. Sc. Phys. VI, 87 (1820).

⁵ Kabath H., Flora der Umgegend von Gleiwitz (1846).

⁶ Vittadini C. Monographia Tuberacearum Med. (1831).

antedated by Rafinesque's¹ *Gautiera*, a substitute for the name proposed by Linnaeus. On the principle that even if the former name is inapplicable, the application of the latter is not thereby justifiable, we herewith propose *Uslaria* for the fungus in honor of J. J. Uslar² one of the earliest authors of a work on plant chemistry and physiology.

Uslaria Nom. Nov.

Gautiera Vitt., (1831) l. c., not *Gautiera* Raf. (1828).

Uslaria morchellaeformis (Vitt.) Nom. Nov.

Gauteria morchellaeformis Vitt.

GUEPINIA AND LAMIA

At least two cryptogams have masqueraded under this name *Guepinia*. One of these that of Hepp,³ could in no sense have the right, so it was changed to *Heppia* Naeg. The *Guepinia* Fries, moreover is untenable being preceded by that of Bastard.⁴ The *Guepinia* Fries. seems to have had a substitute suggested in *Guepiniopsis* Pat., but though a rather unsatisfactory makeshift, it were at least more in accordance with logical procedure than to have two plants with the same name.

The genus of *Entomophthorineae*⁵ called by Nowakowski *Lamia* was preceded by the use of the name *Lamia* Endlicher.⁶ Moreover there is also a *Lakmia* that might be confused. The name is at that only a feminine form of the centuries old name adopted by Linnaeus, *Lamium*. **Culicicola** is suggested to replace the homonym.

Culicicola Nom. Nov.

Lamia Nowak., l. c., not *Lamia* Endlicher, (1841) nor *Lamium* Linn.

Culicicola Culicis (A. Braun). Nov. Comb.

Lamia Culicis (A. Braun) Nowak. l. c.

¹ Med. Fl. I., 204 (1828).

⁶ Gen. 949 (1841).

² Uslar, Johann, Julius, Fragmente neuer Pflanzenkunde, Braunschweig (1794).

³ Hepp. Ph. *Guepinia* eine neue Flechtengattung, Vehr. Schw. Naturf. Gesell. XLVJJJ, 86, (2864).

⁴ Bastard. T., Supp. a l'essai Fl. Dept. Maine et Loire. 35 (1812).

⁵ Entomophthorae (Pam. Akademii umiej. ed. Krakowie 1883). Die copulation einiger Entomophthorien (Bot. Zeit. 1877).

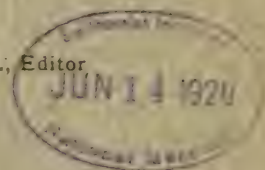
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CRITICAL NOTES ON NEW AND OLD GENERA OF PLANTS.—VIII.

BY J. A. NIEUWLAND.

LIBERTELLA AND LIBERTIELLA

The name *Libertella* and *Libertiella* are but alternate forms of a diminutive of *Libertia*. In any logical and serious system of plant nomenclature neither diminutive would be tolerated because there is a *Libertia* already. Still our modern works of mycology tolerate even these two diminutives for very different plants of closely related orders. *Libertiella* appearing to be the later proposed may be supplanted by *Shecutia* in honor of John Shecut¹ a botanist who wrote a flora of the Carolinas.

Shecutia Nom. Vov.

Libertiella Speg. & Roum. not *Libertella* Desn.

Shecutia malmedyensis (Speg. and Roum).

Libertiella malmedyensis Speg. & Roum.

MAGNUSIA Sacc.

The *Magnusia* Sacc. was anticipated by Klotsch's² plant of the same name. The fungus name may be replaced by **Kernia**

Kernia Nom. Nov.

Magnusia Sacc., Syl. 1: 38.

Kernia nitida (Sacc.) Nov. Comb.

Magnusia nitida Sacc.

MACROPODIA.

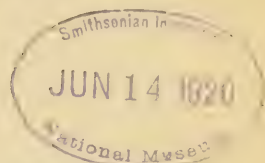
Otto Kuntze³ had already pointed out that the *Macropodia* Fuckel (1869) is invalidated by *Macropodium* R. Br.⁴ In fact

¹ Shecut J., Fl. Carolinaensis (1806).

² Klotsch, J. F., Monatsb. Berl. Acad. March 125 (1854).

³ Kuntze O. Revisio Gen. Pl., I, 852 (1891).

⁴ Brown, R. in Ait. Hort. Kew. ed. II, IV, 108 (1812).



another *Macropodia* Benth¹ (1873) had also been slipped into print. Kuntze in attempting to supersede Fuckel's name by calling the fungus *Fuckelina* overlooked the fact that there was a *Fuckelina* Sacc. Thus invalidating his own new nomenclatorial creation. To replace *Macropodia* Fuckel (= *Fuckelina* Kuntze) *Cowlesia* may be applied.

Cowlesia Nom. Nov.

Macropodia Fuckel (1869) not *Macropodium* R. Br. (1812).
Fuckelina O. Kuntze (1891) not *Fuckelina* Sacc.

Cowlesia Corium (Weberb.) Nov. Com.

Macropodia Corium (Weberb) Cooke, *Peziza Corium* (Weberb.)

Cowlesia macropus (Pers).

Peziza macropus Pers.

Cowlesia bulbosa (Hedw.).

Peziza bulbosa (Hedw.) Nees.

MAURYA

Maurya Pat. is too much like *Mauria* Kunth² (1824) which antedates the fungus name. This should then be changed and *Pluesia* may be suggested in honor of M. Plues, author of works on English Botany.

Pluesia Nom. Nov.

Maurya Pat. not *Mauria* Kunth. (1824) (Anacardiaceae).

Pluesia hypoxylloidea Nov. Comb.

Maurya hypoxylloidea Pat.

MONOCHAETIA Sacc.

Monochaetia used as a subgenus but adopted by Clements³ as a genus is for all purposes the same word with the same derivation as *Monochaetum*⁴ Naud (1845) or *Monochaete* Doel⁵ (1878). One does not make a new name by changing its gender ending. *Lennisia* may replace the fungus of that name.

Lennisia Nom. Nov.

Monochaetia (Sacc.) not *Monochaetum* Naud (1845).

¹ Bentham, G. Fl. Austral. VI, 447 (1873).

² Ann. Sc. Nat. Ser. I, II, (1824).

³ Clements F. E., Genera of Fungi, 137 (1909).

⁴ Naudin. Ann. Sc. Nat. Ser. III, IV, 48 t2 (1845).

⁵ Doell., Mart. Fl. Bras. II, III, 78, t. 22 (1878).

MORINIA

There is a Linnaean genus *Morina* which renders the *Morinia* Berl. and Bres. a homonym, for the reason mentioned in the preceeding paragraph. This latter may be changed to *Rinomia*. A synonym thereto may be seen in *Pestalozzina* Passer, but there is another *Pestalozzina* Sacc., also a *Pestaloziella* Sacc. & Ell., *Pestalozia* de Not. and a *Pestalozzia* Zoll. & Mor. (1846).

Rinomia Nom. Nov.

Morinia Berl. & Bres. not *Morina* Linn.

Rinomia pestalozziodes (Berl. & Bres.).

MYXONEMA

Myxonema Freis (1825), presumed to be but a synonym of *Stigeoclonium* Kutz. (1843) has been taken up for the latter.¹ The *Myxonema* Corda is therefore of course a homonym. This fact illustrates that when once a genus name has been used, it is never safe to apply it to another plant on the plea that it is available because of invalidity of the first or its desuetude. "Once a synonym always a synonym," is the only safe principle to apply to nomenclature if absolute confusion is to be avoided. *Pyonema*, may be suggested to supplant Corda's untenable name.

Pyonema Nom. Nov.

Myxonema Corda, not *Myxonema* Fries (1825).

Pyonema assimile (Corda).

Myxonema assimile Corda.

NOLANEA

Nolanea (Fries.) Sacc is but another form of *Nolana* Linn. To replace it **Lanolea** may be applied for the fungus.

Omphalia Fries is too much like *Omphalea* Linn. (1759). **Phalomia** may be used for the fungus plant.

PECKIA

Besides a *Peckia* Vell.² 1825 there is also a *Peckiella* Sacc. and a *Neo-Peckia* Sacc. The fungus name *Peckia* Clinton is antedated. **Macilvainea** may be used, in honor of Charles McIlvaine author of a popular work on American fungi.

Macilvainea Nom. Nov.

¹ West, G. S., Treatise of the British F. W. Algae, (1904).

² Velloso J., Fl. Flum. 51; Ic. I. t 134, 135 (1825).

Peckia Clinton not *Peckia* Vell., (1825).

Macilvainea Sarraceniae (Peck and Clint.).

Peckia Sarraceniae Peck & Clinton.

PILOCARPUM

Pilocarpus Vahl¹ renders *Pilocarpon* Wainio, called by some *Pilocarpum* Clements,² a synonym. Changing the gender of an existing name ending does not constitute a new name. *Wainioa* may be applied in honor of the author of the fungus genus used as a homonym.

Wainioa Nov. Nom.³

Pilocarpon Wainio, not *Pilocarpus* Vahl. (1796).

Wainioa leucoblephara (Wainio).

Pilocarpon leucoblepharum (Wainio).

PIPTOSTOMA AND PIPTOSTOMUM.

When we consider how readily and easily and without attempts at explanation even mycologists change the endings of words e. g., from *on* to *um* etc., and that too without consciously seeming to consider that they have made any essential variation in a name, we wonder that the converse of this is lost sight of. *Pilocarpum* Clements is the same as *Pilocarpon* Wainio, and no objection is made, and they are at liberty considered interchangeable. On the other hand there is a *Piptostoma* Besk. and Br. and a *Piptostomum* Lev. and no one seems to object that they are the same word. If interchangeable in one case they are identical⁴. No two distinct plants ought to have the same name. If besides we find such two in the same work and both recognized, we have a right to feel surprised at the slipshod methods of mycological nomenclature, as much as at the logic or lack of it that permits a thing in one case and forbids it in another.

PIPTOCEPHALIS

Piptocephalum Sch.⁴ and *Piptocephalis* are homonyms in spite of different endings. **Mucoricola** may be used for the fungus.

¹ Vahl. Ecolog. 1. 29, t 10, (1796).

² Clements, F. E., Genera of Fungi, 76 (1909).

³ Should there be a *Wainioa* already we may use as alternate the name *Limbalba*.

⁴ Bonplandia VIII, 369 (1860).

PILOPHORUM

This name *Pilophorum* is another example of one whose ending is indifferently used as *on* or *um* or even goes as *Philophorus* Nyl. Though there is an older *Philophora* Jacq.¹ Nevertheless the name of the fungus later used finds its way in all our books on these plants, and that too with the variations shown! This inconsistency, moreover, does not seem to affect the matter in the least. We suggest the name **Crinofera** for the homonymous fungus name.

POLYCEPHALUM

Polycephalos Forsk.² is an older name than the *Polycephalum* Kalchb. & Cooke. *Gremlia* may be used for the fungus homonym, in honor of August Gremli, author of a work on the flora of Switzerland.

Gremlia Nov. Nom.

Polycephalum Kalchbr. & Cooke, not *Polycephalos* Forsk.

Gremlia aurantiaca (Kalchbr. & Cooke).

Polycephalum aurantiacum Kalchbr. & Cooke.

PTERYGIUM Nyl.

Pterygium Nyl. can not remain as the Lichen name because of an older *Pterygium* Endl.³ also written *Pterigium* by Correa.⁴ To replace it may be suggested *Calkinsia* in honor of W. W. Calkins a most zealous student and collector of American lichens. The plant had been called *Wilmsia* but there was another plant claiming that name.

Calkinsia Nom. Nov.

Pterygium Nyl. not *Pterygium* Endl. (1847) nor *Pterigium* Correa (1806) l. c. *Wilmsia* Körb. not Lahm = *Pachyphiale* Lönnr.

Calkinsia subradiata (Nyl.).

Pterygium subradiatum Nyl.

Calkinsia panariella (Nyl).

Pterygium panariellum (Nyl).

PYTHIUM

Pythium Pringsheim would appear to be invalid because of

¹ Frag. 32 t 35, (1800) Also *Pilophoron*.

² Forskal, Fl. Aegyp-Arab. 154 (1775).

³ Endlicher, Gen. 1013 (1841).

⁴ Correa, Ann. Mus. Par. VII, 397 (1806).

the older *Pythion* Mart.¹ (1831) which is but an alternate Greek writing of the other, the Latin form. There is, moreover, an older *Pythius* Raf.² (1836). We rename the group *Eupythium*, raising the typical section name to generic standing. *Artotrogus* Montagne, was not selected apparently as a name for the aggregate, but for the typical section of it and in our opinion is ineligible, because it might sometime be required for a separate genus name.

Eupythium Nom. Nov.

Pythium Pringsheim, not *Pythion* Mart., (1831) nor *Pythius* Rafinesque, (1836).

Eupythium proliferum (De Bary).

Pythium proliferum DeBary.

Eupythium debaryanum (Hesse).

Pythium De Baryanum Hesse.

Eupythium sadebeckianum (Wittmack).

Pythium sadebeckianum Wittmack.

Eupythium Anguillulae (Sadebeck).

Pythium Anguillulae Sadebeck.

ROBERGEA.

Robergea Desmaz. is scarcely different from *Roegneria* Schreb.³ and in any system of pronunciation of names can not be distinguished. As the pronounced name constitutes the homonym in spite of spelling, the fungus name must yield to the older one. *Bergorea* may be substituted.

Bergorea Nom. Nov.

Robergea Desmaz. not *Roegneria* Schreb.

Bergorea unica (Desmaz).

Robergea unica Desmaz.

Bergorea albifrons (Tulas).

Robergea albifrons Tulas.

SCOPULARIA

Scopularia Preuss, according to the laws of priority must give way because of the existence of an older *Scopularia* Lindley⁴ (1834.) *Lindavia*⁵ is suggested as a substitute for the fungus plant.

¹ Martius, Flora XIV, 459 (1831).

² Rafinesque, C. S., Fl. Tell., IV, 116 (1836).

³ Schreber, Gen. 309 (1789).

⁴ Lindley J., Bot. Reg. Sub. t. 1701 (1834).

⁵ In case *Lindavia* be already used *Outhovia* may be substituted as an alternate.

Lindavia Nom. Nov.

Scopularia Preuss, not Lindley (1834).

Lindavia venusta (Preuss).

Scopularia venusta Preuss.

SCUTULA

The name *Scutula* for a fungus can not remain as there was a plant of that name used by Loureiro.¹ For the plant in the Patellariaceae family **Spilodium** Mass. should be used.

Spilodium epiblastimaticum (Wallr.)

Scutula epiblastimatica (Wallr.) Rehm.

Spilodium Stereocaulorum (Th. Fr.)

Scutula Stereocaulorum (Th. Fr.) Korb.

SPHAEROCEPHALUM

Sphaerocephala Hill.² is an older application than *Sphaerocephalum* Wiggers.³ The genus of Lichens may be designated **Descemetia** in honor of the author of a medical flora of the 18th century, Jean Descemet.

SPHAEROTHECA

Sphaerotherca Lev. should give way because of the older *Sphaerotherca* Cham & Schecht.⁴ Leveillé's plant may be called *Destangsia* after Stanislaus Desetangs, author of a work on popular names of plants.

Desetangsia Nom. Nov.

Sphaerotherca Lév. not Chan & Schecht. l. c.

Desetangsia Humuli (DC.).

Sphaerotherca Humuli DC. Schröt.

Desetangsia Epilobii (Link) Sacc.

Sphaerotherca Epilobii (Link) Sacc.

Destangsia Mors Uvae (Schwein).

Sphaerotherca Mors-uvæ (Schwein) Berk. & Cort.

Desetangsia Drabae (Juel).

Sphaerotherca Drabae Juel.

TONINIA

Toninia (Mass.) Th. Fr. is really the same name as *Tonina*

¹ Loureiro, Fl. Cochin Chin., 235 (1790).

² Hill. J., Veg. Syst. IV, 48 (1762).

³ Wiggers (Weber G. H.) F. H., Pr. Fl. Holsat., 87 (1780).

⁴ Chamisso A. v. Schechtendal D. F. L., Linnaea-II, 605 (1827).

Aubl.¹ (1775) the latter many decades older. *Syncomista* the specific name of one of the species seems appropriately adapted for generic caption of the group.

Syncomista Nom. Nov.

Toninia (Mass.) Th. Fr. not Aublet (1775) l. c.

Syncomista cinereovirens (Schaer).

Toninia cinereovirens (Schaer) Mass.

Syncomista squarrosa (Ach).

Toninia squarrosa (Ach) Th. Fr.

Syncomista aromatica (Sm.)

Toninia aromatica (Sm.) Mass.

Syncomista humicola Nom. Nov.

Toninia syncomista (Fl. K.) Th. Fr.

SPHAEROSPORA

Sphaerospora Sacc. is antedated by a *Sphaerospora* Sweet² and must be changed. *Rubelia* may be used instead of Saccardo's name. F. Rubel wrote on *Agaricus* in the 18th century.

Rubelia Nov. Nom.

Sphaerospora Sacc. not Sweet l. c.

Rubelia trechispora (Berk. & Br.).

Sphaerospora trechispora Berk. & Br.

Rubelia confusa (Cooke).

Sphaerospora confusa (Cooke) Sacc.

Rubelia Barlae (Boud).

Sphaerospora Barlae (Boud) Sacc.

Rubelia verruculosa (Berk. & Br.).

Sphaerospora verruculosa (Berk. & Btt.). Sacc.

KABATHIA

*Kabathia*³ suggested by us as a substitute for *Darluca* Cast. is too much like the fungus name *Kabatia* (*Hyalididymac*.) *Leptostomalaceae*). **Mycepimyce** may be used for our *Kabathia* whose homonymy was inadvertently overlooked by us.

¹ Aublet, F., Pl. Gui. II, 856, t 330 (1775).

² Sweet R., Hort. Britt. ed. I, 398 (1827).

³ Am. Mid. Nat. IV, 377, (1916).

THE NAIADES OF MISSOURI.—VI.

BY WILLIAM I. UTTERBACK.

Lasmonos simpsoni (Ferriss).

(Simpson's Shell.)

Pl. XXVI, Figs. 91 A and B.

1900—*Lampsilis simpsoni* Ferriss, Nautilus, xiv, p. 38.

ANIMAL CHARACTERS unknown to writer.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell subovate, elongated, sub-solid, narrowly rounded in front, broadly rounded behind, somewhat alated; disk smooth; beaks low, sculptured by ridges somewhat corrugated and nodulous; epidermis tawny with green rays with rather roughened growth lines; hinge line evenly curved.

INTERNAL STRUCTURES:—Cardinals reduced to mere stumpy rudiments; laterals single in right, very faintly double in left valve; anterior scars rather deep, posterior shallow; nacre bluish shaded with violet, copper or pink.

Sex	Length	Height	Diameter	Locality
♂	78	x	46	x 28mm. (White R., Hollister)
♀	95	x	50	x 22 " (" " ")

MISCELLANEOUS REMARKS:—No juveniles, nor young shells, have been obtained by the writer in this State. However, Mr. Ferriss, the author, has obtained a good suite from Spring River, Hardy, Arkansas, and has described the young shells as possessing an epidermis with green rays and "coppery beaks," a well marked post-umbonal ridge and low but distinct beaks with coarse corrugations. The author of this species, groups it between *Lasmonos fragilis* and *leptodon*. From the former it may be distinguished by a thicker more elongated shell, by more reduced hinge teeth and less varigated nacre and from the latter by being more inflated, wider, thicker, not so pointed posteriorly and with fewer rays. Hence its place can be fairly well determined conchologically. Future studies of its marsupial and glochidial characters of this species, as well as that of *leptodon* (= *S. tenuissimus* Lea), may classify it far differently, since shell characters are too liable for parallelism and convergence as true bases of classification.

Lasmonos leptodon? (Rafinesque).*Not Figured.*

1820—*Unio (Leptodea) leptodon* Rafinesque, Ann. Gen. Sci. Phys. Brux., p. 295, Pl. LXXX.

1829—*Symphynota tenuissima* Lea, Tr. Am. Phil. Soc., III, p. 435, Pl. XI, Fig. 21.

This species is listed here on the strength of reports of its occurrence in the Mississippi and Neosho Rivers of this State. From a shell, (measuring 58x31x14mm.), received from Michigan through exchange, the author is able to make comparisons and thus concur with the general assumption that it should group under *Lasmonos*. However, superficial observations would group it near *Lastena ohiensis*, but presence of hinge teeth, although not well developed, and also different beak sculpture would sufficiently separate it. Surely the "clear water streams" of South Missouri may also yield specimens of this species since the same rivers that reach up into Missouri are reported to bear it in Arkansas. Scammon (1906, pp. 304 and 305) reports it for Kansas and Simpson describes its general range for the upper Mississippi drainage south to the Tennessee River and for Southern Michigan.¹

Genus Proptera Rafinesque.

1819—*Proptera* Rafinesque, Monog. An. Gen. Sci. Phys. Brux.;—1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 566, (as sub genus); 1912b, Ortmann, An. Car. Mus., VIII, p. 332.

(Type, *Unio alatus* Say)

ANIMAL CHARACTERS:—Branchial opening with dense papillae; anal crenulated; supra-anal small, moderately closely connected to anal; inner laminae entirely connected to visceral mass; palpi only slightly antero-dorsad; marsupia reniform occupying posterior part of outer gills, consisting of several ovisacs; conglutinates not solid, broken; glochidium ax-head or celt-shape, usually armed with two spines at each corner of ventral edge of each valve; mantle border antero-ventrad to branchial opening slightly lamellar with crenulations only.

SHELL CHARACTERS:—Shell subelliptic or subovate, solid to thin, strongly alated post-dorsad; disk smooth; hinge fairly well

¹ The presence of *L. leptodon* in Missouri need not be so questionable now because of A. A. Hinkley's recent report of it in the James River at Galena this State. (Dec. 23, 1915, Pr. U. S. Nat. Mus., Vol. 49, p. 588.)

developed; beaks low, sculptured by the early bars of fine concentric arrangement and later one of double-looped type—sometimes rather nodulous at base of post ridge; sexually dimorphic, the female shell being wider posteriorly by the expansion of the post-ventrad edge of shell.

MISCELLANEOUS REMARKS:—With the exception of unique glochidium and more developed hinge this genus stands with *Lasmonos*. *Proptera* is represented in this state by the four species: *alata*, which is found mostly in Central Mo., *purpurata* which only occurs in South Mo., *laevissima* which is mostly restricted to North Mo., and *capax* which is entirely confined to the Mississippi River. The last named species has not been definitely settled within any genus before on account of a lack of an exact determination concerning the morphology of its animal. The extreme inflation of the *capax* shell, as compared to the compressed-type of the other members of this genus, would seem to shut it out, but glochidial and marsupial characters (besides its similar beak sculpture) are by far more reliable affinities. All the members of this most sharply defined genus are long period breeders.

***Proptera alata* (Say).**

("Razor Back," "Rudder Back," "Hatchet Back,"

"Pan Cake.")

Pl. IV, Fig. 11a.

1816—*Unio alatus* Say, Nich, Encyc., II, pl. IV, fig. 2.

1898—*Lampsilis alatus* Baker, Moll. Chicago, Pt. I, p. 97, pl. XVIII.

1912b—*Proptera alata* (Say) Ortmann, An. Car. Mus., VIII, p. 333.

ANIMAL CHARACTERS:

NUTRITIVE STRUCTURES:—Branchial and anal openings inclined to tubular structure, branchial upcurved, small with numerous papillae; anal smooth thick edges; supra-anal large thick and close mantle connection to anal; inner laminae of inner gills entirely connected to visceral mass; palpi about as wide as long, connected about one-half of their length antero-dorsad; color of soft part tan-flesh color with dark mantle edges and orange colored cerebral ganglion.

REPRODUCTIVE STRUCTURES:—Marsupia large, occupying posterior half of outer gills, consisting of large ovisacs sulcated ventrad mantle edge antero-ventrad to branchial opening lamelar with

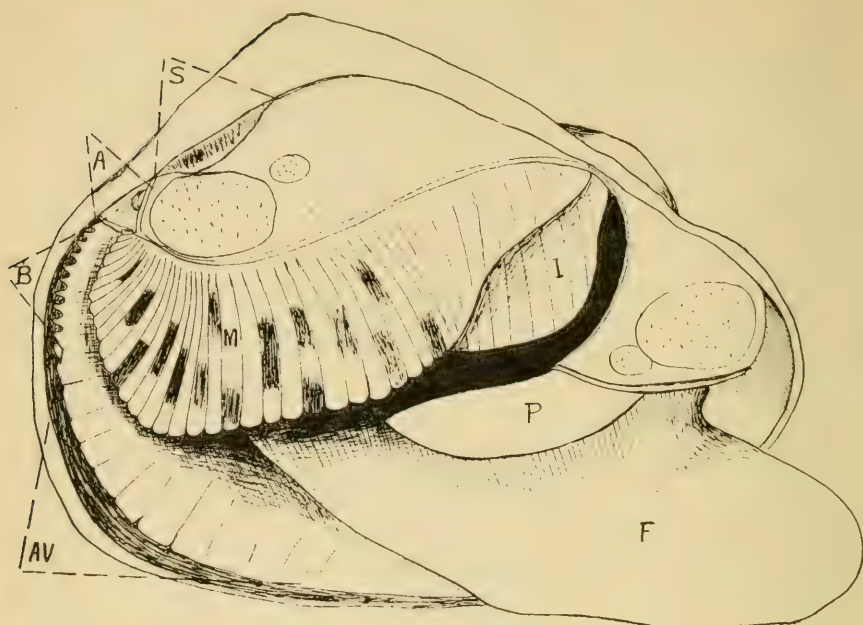


FIG. 8. *Proptera alata* (Say) ♀. Diagram of a gravid individual from Platte River, Agency Ford, showing animal characters in left valve. Coll. June 7, 1913. ($\frac{3}{4}$ Nat. size.)

crenulations; conglomerates large, broken with ova or glochidia all through the mass; glochidia large, ax-head shape, with spine at each ventral corner of shell (0.220 x 0.380 mm.).

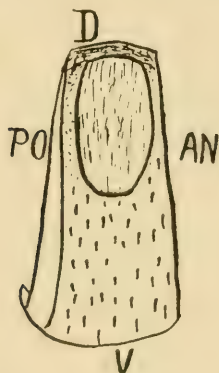


FIG. 9a. Lateral view of mature glochidium of *P. alata*. (x87.)

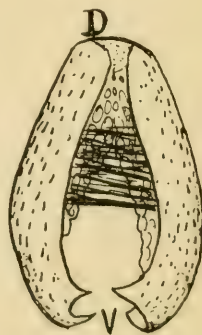


FIG. 9b. Anterior view of open glochidium of *P. alata*. (x87.)

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell large broadly elliptical, solid alated post-dorsad; somewhat inflated at middle of disk, beaks low sculptured concentrically and also double-looped; disk not sculptured; epidermis usually black-reddish with broad rays in young specimens; female shells blunt, or even truncate, vertically for its posterior end.

INTERNAL STRUCTURES:—Cardinals erect-double in both valves; laterals also double placed at an upward angle; beak cavities moderately deep; nacre usually purple.

Sex	Length	Height	Diameter	Locality
♀	156	x 117	x 56.5	(Platte, R., Dixon Falls)
♂	150	x 114	x 53.0	(" " Platte City)
♀	115	x 55	x 33.0	(Osage R., Warsaw)
♀	82	x 54	x 26.0	(Grand R., Utica)

MISCELLANEOUS REMARKS:—This species is most typical in North Missouri; the shell is thinner, smaller and rather dwarfed in Central Missouri and is wholly lacking in South Missouri drainage. The writer has only found *alata* lacustrine on one occasion, but that may have been due to accidental translocation. Breeding records show it to be bradytictic. The writer has observed that most marsupia of this species, when gravid with ripe glochidia, have purplish blotched marsupia; this character, however, is rather inconstant. *Alata* has a general distribution throughout the Mississippi and St. Lawrence River basins.

Proptera purpurata (Lamarck).

("Purple Shell," "Purply," "Buttermilk Shell," Red Shell.")

Pl. XXVI, Figs. 92 A—D.

1819—*Unio purpurata* Lamack, An. Sans. Vert., VI, p. 71.

1900b—*Lampsilis purpuratus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 568.

1912b—*Proptera purpurata* (Lam.) Ortmann, An. Car. Mus., VIII, p. 234.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Identical with those of *alata*.

REPRODUCTIVE STRUCTURES:—Marsupium consists of twenty ovisacs placed in posterior half of outer gills; glochidia (according to Lea) ax-head shape—no measurement given.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell large, rather elongate—ellip-

tical, inflated; disk smooth; beaks high and full; post dorsal ridge somewhat alated; post umbonal ridge biangulated; epidermis glossy black.

INTERNAL STRUCTURES:—Cardinals double in both valve; laterals prominent, blade-like; umbonal and branchial cavities deep and rounded out; nacre rich purple.

Sex	Length	Height	Diameter	Locality
♂	120	x	75	x 53mm (White R., Hollister)
♀	125	x	70	x 44mm (" " Forsyth)
♂	83	x	56	x 40mm (" " Hollister)
♀	70	x	47	x 34mm (" " ")

MISCELLANEOUS REMARKS:—The young shells of *P. purpurata* are thin and fragile but later become thick and solid; resembling *alata* in form and nacre but is more so alated not compressed. This shell only appears in the White and Neosho River basins and is one of the few not found in the Mississippi. Its favorite habitat is deep water and mud bottoms. It is hoped its glochidium may be verified and more proportionate measurements given than Lea was able to record.

Proptera laevisissima (Lea).

("Paper Shell," "Double Wing.")

Pl. IX, Figs. 19 and 20; Pl. XXVI, Figs. 94 A—D.

1830—*Symphynota laevisissima* Lea, Tr. Am Phil Soc., III, p. 444, pl. XIII, fig. 23.

1900b—*Lampsilis laevisissima* Simpson, Pr. U. S. Nat. Mus., XXII, p. 574.

1912b—*Proptera laevisissima* (Lea) Ortmann, An. Car. Mus., VIII, p. 334.

ANIMAL CHARACTERS

NUTRITIVE STRUCTURES:—Branchial and anal openings very tubular, directed away from each other; anal smooth; supra-anal high, well separated from anal by mantle connection; inner laminae of inner gills entirely connected to visceral mass; palpi broader than long, connected about one-half of the length antero-dorsad; color of soft parts a modest tan, except for mantle edges at siphonal openings and the area over nephridium.

REPRODUCTIVE STRUCTURES:—Marsupium large, kidney-shaped occupying over half of posterior part of outer gills and consisting 50-60 narrow ovisacs somewhat distended transversely

and very much so ventrad from original edge of sterile marsupium, ventral tips of ovisacs teat-like, not colored; conglutinates white, discharged in broken disintegrated masses; glochidium ax-head shape or celtiform, small with spine-like structures measuring 0.100 x 0.155mm; branchial mantle edge thickened, lamellar, but without palpilae.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elliptical compressed, thin, bialated, post-ala being drawn near to the beaks in definite lobes of growth, sometimes curved laterally; disk without any sculpture; post-umbonal ridge absent, female shell swollen post-ventrad; epidermis brown-glistening horn-color with faint rays and areas of indigo blue especially on post wing; beaks low, suppressed sculptured with a few fine concentric lines and a row of three small tubercles on line with a post-ridge.

INTERNAL STRUCTURES:—Cardinals thin, erect, double in right, single in left valve, laterals rather reduced; scars somewhat faintly impressed; beak and branchial cavities rather shallow; nacre solid purple.

Sex	Length	Height	Diameter	Locality
♂	150	x 105	x 42mm	(102 R., St. Joseph)
♂	145	x 90	x 39mm	(Mud Lake, Kenmoor)
♀	137	x 89	x 37mm	(Platte, R., Agency Ford)
♀	41	x 23	x 12mm	(Lake Contrary, St. Joseph)

The last measurement of a juvenile—the youngest and smallest *Naiad shell ever found gravid by the writer*. Its glochidia were normal. Many of these juveniles are in the writer's cabinet, having been collected in "nests" from L. Contrary for the most part. The shells are like those of ground glass in color and translucent both externally and internally. Beaks are rather apiculated and marked by rather coarse concentric ridges with three teat-like tubercles arranged in a row on line with post-ridge, resembling juvenile beak sculpture of *Lasmionos*.

MISCELLANEOUS REMARKS:—This species may represent the critical transition period from the primitive to the actual modern forms. Its glochidium is not a true *Proptera form in not* possessing typical spines at the ventral corners of its valves. Coker and Surber (1911, pp. 179-182) have pointed out its metamorphosis in the parasitic life as eccentric in that the glochidium remains

intact as a saddle over the beginning of its adult shell. No species, perhaps, has such tubular development of mantle edges for the branchial and anal openings. In this state its distribution is peculiar, being almost exclusively found in North Missouri and never in South Missouri. It is often found in company with *alata* from which it can be separated on account of thick shell and coarser epidermis of the latter. It may be mentioned here that *lacvissima* shows the highest modern development of the siphonal openings, i. e., into the actual tubular form. (See Plate IX). This Species is distinctly bradyctic.

Proptera capax (Green).

("Pocket Book," "Swell Shell.")

Pl. XXVI, Figs. 93 A and B.

1832—*Unio capax* Green, Cab. Nat. Hist., II, p. 290.

1899—*Lampsilis capax* Smith, Bull U. S. Fish Com., p. 291, pl. LXXIV.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with rusty red papillae arranged in two ranks; anal finely crenulated; *supra-anal* large with two large tentacular structures on each mantle edge; inner laminae of inner gills entirely connected; palpi rounded antero-ventrad, connected antero-dorsad two-thirds of their length; color of soft parts tanish, mantle edge antero-ventrad, reddish-brown.

REPRODUCTIVE STRUCTURES:—Marsupium occupying the greater posterior part of the outer gill, consisting of about fifty small ovisacs distended transversely when gravid, and being also distended at the distal ends the ovisacs presenting teat-like appearance; *no mantle flap antero-ventrad to branchial opening*, nor any specialization except for a thickening of the mantle edge; conglutinates not solid, white; glochidium ax-head or hatchet-shape in form, spined, rather small, 0.105 x 0.185mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell rather globose, extremely inflated; disk smooth; beaks extremely full, round, high, sculptured with single tubercles on incurved tips surrounded by fine concentric ridges looped into two or three small tubercular markings at very base of post ridge; epidermis smooth, polished,

brown horn-color, sometimes with yellowish narrow bands parallel to growth lines, rayless.

INTERNAL STRUCTURES:—Cardinals double in right, slightly so in left valve and arranged parallel with laterals; interdentum short; laterals single in right, double posteriorly in left valve; beak and branchial cavities very deep and large, basin-like; nacre white with light rosy pink in branchial cavities, border light bluish.

Sex	Length	Height	Diameter	Locality
♂	10 x	82 x	65mm	(Mississippi R., Hanibal)
♀	95 x	75 x	66mm	(" " ")
♀	66 x	50 x	42mm	(" " La Grange)

MISCELLANEOUS REMARKS:—*Capax* has the most inflated shell of the *Naiades*, yet because of the fact that it is rayless and has no sex dimorphism, nor furrowed beak sculpture, nor pure white nacre of *L. ventricosa* it must be removed far from the latter although its immensely inflated shell would superficially class it near *ventricosa*. Its great inflation is not any greater, however, than that of the relative inflation of the *laevis* shell in the last stage of its parasitic life. Most of all, anatomical material kept by the writer, shows no mantle flap (*Pl. XXVI, fig. 93 B*) as seen in *L. ventricosa*, nor as to be noted in any *Lampsilis*, and the mantle edge antero-ventrad to the branchial opening is not even as much specialized as in *laevis*, or *alata*; hence its place perhaps should precede *laevis*, at least, but is placed last in the grouping under this genus on account of its most peculiarly inflated shell which may show an advance over the other species that show the other extreme in possessing a compressed shell in their adult life. *Capax* is very rare shell for this State. It has a rather limited geographical distribution over the whole country; however, Simpson reports it as abundant locally, yet the writer's experience in collecting it for in the Mississippi is that it is rare even there and it was considered a stroke of good fortune to secure glochidially gravid material showing proptera characters.

Genus *Carunculina* Simpson.

(Type, *Unio parvus* Barnes.)

1898—*Carunculina* Simpson (in Baker, p. 109, as section).

1900b—*Carunculina* Simpson. Proc. U. S. Nat. Mus., XXII, p. 563. (as subgenus); 1912b, Ortmann, Car. Mus., VIII, p. 337 (as subgenus).

ANIMAL CHARACTERS:—Branchial opening small with rather

large papillae; anal smooth, supra-anal large, closely connected to anal; inner laminae of inner gills free, more or less, from the visceral mass; palpi small, connected half of their length antero-dorsad; marsupia formed by a few large ovisacs occupying posterior part of outer gills, reniform; branchial edge with a papillose caruncle; conglutinates solid, white, club-shaped, glochidia medium in size, semi-elliptic.

SHELL CHARACTERS:—Shell very small, elliptic, rounded before, rather thick, disk smooth; beaks low, coarsely sculptured by regular concentric bars upcurved behind; epidermis dark cloth-like.

MISCELLANEOUS REMARKS:—This is a good genus as now considered by Dr. Ortmann who treated it at first (1912, p. 337) as a subgenus for *Eurynia*, but even then he was inclined to consider it as merely conventional whether we use it generically or subgenerically. *Carunculina* is remarkable for its smallest sized shells, for its unique beak sculpture and for its peculiarly specialized mantle edge antero-ventrad to the branchial opening. It is well represented in this State by the type, *parva*, and although the writer has not personally collected *texasensis* and *glans* yet these two have been reported in such manner that they can be definitely listed.

Carunculina parva (Barnes).

("Liliput Shell.")

Pl. III, Fig. 8c; Pl. XXVII, Figs. 95 A—D.

1823—*Unio parvus* Barnes, Am. Jl. Sci., VI, pl. XIII, fig. 18 (outline).

1900b—*Lampsilis parvus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 564.

1912b—*Eurynia (Carunculina) parva* Ortmann, An. Car. Mus., VIII p. 338.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial small, directed upward, with few but large papillae; anal also pointed upward, smooth, supra-anal present, closely but definitely connected by mantle edge; inner laminae of inner gills usually free from visceral mass about one-half of their length; palpi comparatively large, connected antero-dorsad about two-thirds of their length; color of soft parts tan-color except for a blackish or reddish border to mantle at branchial opening.

REPRODUCTIVE STRUCTURES:—Marsupia kidney-shaped, con-

sisting of twenty ovisacs, well marked, occupying posterior half of outer gills, somewhat distended transversely and also at distal ends below the original line of sterile marsupium: border of mantle antero-ventrad to branchial opening greatly specialized into a double row of red papillae terminating in a knobbed caruncle, which, under (x87) lens, is cellular—each cell being hexagonal in shape; conglutinates white, discharged whole, club-shaped; *glochidia medium in size, sub-elliptical, hinge line straight, spineless, measures 0.175 x 0.100.*

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell very small, rather thick, elliptical, rounded before, disk without sculpture; beaks low with six coarse regular, parallel bars evenly curved up at foot of post-ridge region; epidermis brownish to reddish or olivaceous, cloth-like female shells broader posterior ends made by more swollen post ventral portion, males with pointed shells.

Sex	Length	Height	Diameter	Locality
* 38	x	23	x 19mm	(Lake Contrary, St. Joseph—)
♂ 27	x	13	x 11mm	(Pond, Columbia)
* 25	x	13.5	x 11.5mm	(Lower L. Contrary, St. Joseph)
* 14.5	x	8.5	x 5.5mm	(Singleton Lake, Halls)
* 11.5	x	6.5	x 4.0mm	(" " ")

The writer obtained about forty juveniles, within the range of the last two measurements, in shallow clear water along the northwest shore of Singleton Lake. They were confined to a small space and were traced here and there among a maze of tiny tracks. These juvenile shells differ from the adult by a thinner shell, more pointed posteriorly, a more greenish epidermis, more compressed, and by a coarser beak sculpture which, although arranged the same in its concentric bars curved up posteriorly, yet they extend down well on the center of the disk. (*See Pl. III, fig. 8c*).

MISCELLANEOUS REMARKS:—*The writer is able to bear out the statements of Drs. Sterki and Ortmann that parva is locally hermaphroditic.* In the past three years, hundreds have been collected in nearly all the Northwest Missouri lakes and streams, but not a single one has been found without the marsupial character of gills and the sexually dimorphic female shell. However, the male and female shells appear in Central Missouri. In all specimens

* This symbol (*) would indicate hermaphroditism here.

for this State the writer finds the supra-anal opening present. Its presence has been doubted by some other writers. This pygmy mussel has great vitality. The writer records thirty-eight heart beats per minute—among the most rapid of the *Naiades*. It is one of the most active in its locomotion. Its breeding season show it to be bradytictic. *The writer has been fortunate to secure parva's glochidium and make more of a definite study than has been recorded since Lea left his studies.* (Obs. XIII, 1874, pl. XXI, fig. 2.)

Carunculina texasensis (Lea).

("Texas Shell.")

Not figured.

1857—*Unio texasensis* Lea, Pr. Ac. Nat. Sci. Phila., p. 84; Jl. Ac. N. Sci., IV, 1860, p. 359, pl. XLI, fig. 184.

1862—*Unio bealei* Lea, Jl. Ac. N. Sci., V., p. 204, pl. XXX, fig. 273.

1912b—*Eurynia (Carunculina) texasensis* Ortmann, An. Car. Mus., VIII, p. 339.

ANIMAL CHARACTERS:—The writer not having seen the soft parts of this species quotes Simpson's description:—"Animal with marsupium consisting of a few large ovisacs (8 to 13); inner gills wholly, or in part, free from the abdominal sac; female often having a well developed caruncle on the mantle below the branchial opening."

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, rather thick, subinflated, smooth, rounded before, pointed post-dorsad; post-umbonal ridge rather prominent, especially in the female shell, which is shorter, more inflated and not so pointed posteriorly; epidermis a dark slaty color with one or two whitish rest lines; beaks low with coarse concentric bars upcurved at base of post-ridge.

INTERNAL STRUCTURES:—Cardinals double in right, faintly so in left valve; laterals single in both; interdentum lacking; beak and branchial cavities rather shallow and iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♂	45	x 24	x 17.5, mm	(Lost Creek, Amity)
♀	37	x 20	x 12.0 mm	(Lost Creek, Amity)

MISCELLANEOUS REMARKS:—Comparison to some types of *texasensis* from Wimberly Lake, Texas, assures the writer that

the specimens of the above measurements are a near approach, at least, to this species. However, this species is listed for Missouri on the strength of Mr. Simpson's report of it for Harrison County, Missouri, where the famous author of the "Synopsis of the Naiades" used to reside. He states that *texasensis* ranges north into northern Missouri, southern Illinois and Indiana. This species is a good one and should be shut out of the synonymy of *parva* especially because its posterior end of shell is never evenly rounded, nor is its epidermis as cloth-like and nacre as white as that of *parva*. The sex dimorphism, too, is different, as determined by the above description of shell.

***Carunculina glans* (Lea).**

("Little Purple.")

(*Not figured.*)

1834—*Unio glans* Lea, Tr. Am. Phil. Soc., p. 82, Pl. VIII, fig. 12, Obs. X, 1863 p. 402.

1900b—*Lampsilis glans* Simpson, Pr. U. S. Nat. Mus. XXII, p. 565.

1912b—*Eurynia* (*Carunculina*) *glans* Ortmann, An. Car. Mus., VIII, p. 339.

ANIMAL AND SHELL CHARACTERS:—Since the writer has not secured any actual shells or soft parts for this species the descriptions of these parts do not appear here.

MISCELLANEOUS REMARKS:—The writer would also lay claim to this species for Missouri from Simpson's report of it for the White River, and also from a few scattered reports of it through some local collectors for the Elk River and other Southern Missouri streams. From Lea's description (Obs. X., 1863, pp. 402 and 405) and also from Wilson and Clark's (1912, p. 48) this species falls under this genus. From shells received by the writer in exchange it would seem to be more nearly like a young *P. purpurata*. It is distinguished from *C. parva* in being a wider, shorter, thicker, heavier and more polished shell and also in possessing a prominent post-umbonal ridge and a coppery and purple nacre.

Genus *Eurynia* Rafinesque.

(Type, *Unio recta*, Lamarck.)

18120—*Eurynia* Rafinesque Monog., Ann. Gen. Sci. Phys. Brux.; 1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 534 (as section); 1912b, Ortmann An. Car. Mus., VIII, p. 336 (as genus).

ANIMAL CHARACTERS:—Siphonal openings well formed; inner laminae of inner gills usually entirely connected to the visceral mass; in male no specialization, but in female the inner edge of mantle antero-ventrad to branchial opening always with well developed papillae, or short tentacles which often extend to the central of ventral edge; marsupium reniform, swollen, consisting of many ovisacs occupying posterior part of outer gill and ventral edges beaded in white or black pigment when gravid; conglomerates white, not very solid; glochidia large or medium in size, semi-elliptical.

MISCELLANEOUS REMARKS:—The special structures on the mantle antero-ventrad to the branchial opening would group this genus among the highest of the *Lampsilinae* from the fact that the aëration of the embryos is well secured through such specialization. Especially because of the number, form and arrangement of the papillae two sub-genera may be marked out. In the following description when the specialized mantle edge is discussed the female is considered.

Sub-genus **Micromya** Agassiz.

(Type, *Unio fabalis* Lea.)

1852—*Micromya* Agassiz, Arch. für Nat., p. 57; 1912b, Ortmann, An. Car. Mus., VIII, p. 337.

ANIMAL CHARACTERS:—Mantle edge antero-ventrad to branchial opening specialized by papillae, both regular and irregular, arranged rather widely separated in a single row but never extending to the middle of the ventral margin; inner laminae of inner gills entirely connected, or more or less free.

SHELL CHARACTERS:—Shell sub-elliptical, small or medium in size; beak sculpture rather double looped-or distinctly sinuate with the posterior sinuation rather open.

MISCELLANEOUS REMARKS:—This sub-genus is represented in this state by three species—all found only in the Ozarks. The type *fabalis* of Lea of *Micromya* is not found anywhere in Missouri. The essential distinction between the two sub-genera, *Micromya* and *Eurynia* (sens. strict.) is in the less extensive and less crowded arrangement of the papillae on the inner edge of the mantle antero-ventrad to branchial opening in the former.

(To be continued.)

THE STORY OF OUR BIRDS THROUGHOUT THE YEAR 1915.

BY BROTHER ALPHONSUS, C. S. C.

(CONCLUDED.)

Time will permit but a glance at a few of the many interesting facts disclosed by the arrival and the departure of our birds in May. There was only one record of the Downy Woodpecker in May—on the 28th; the last record in April was on the 20th; and the species did not reappear until June 25th. This woodpecker closely resembles the White-breasted Nuthatch in its spring migration. The Snowbird departed on May 3, 1915 and on April 28, 1914. My latest record for this species was May 20, which was quite exceptional.

The Hermit Thrush is a species whose stay with us each spring is notably prolonged. Arriving this year on April 9, and departing on May 31, the Hermit Thrush remained 52 days. In 1914 the time was almost identical, the bird leaving one day later, and arriving on the same day. In 1913 the date of departure was May 30. These dates disclose remarkable regularity in the time of departure of the Hermit Thrush.

The Myrtle Warbler arrived this year on April 19 and departed on May 20—a stay of 31 days. This is the hardiest of the warblers, always arriving the earliest in spring and leaving the latest in autumn. The dates of migration for this species in the spring of 1914 were very close to those of the present year—arriving April 18, and leaving May 17.

Some scattered observations made in May will now be given.—May 7.—Young Killdeers out of the nest, and fledged.—May 9.—A Spotted Sandpiper was startled by the report of a gun and the howl of a dog that was shot; the note of the Sandpiper was piercing.—May 11.—Blackburnian Warbler feeding on insects in apple blossoms; uttered its characteristic note at frequent intervals; by this note the bird may be easily known, as well as by its striking plumage.—May 18.—Saw my first Mourning Warbler—no note; moved slowly in elms, flying a few feet at a time.—May 21.—20 species of warblers seen up to date.—3:30 p. m., a Night-hawk resting in a road-way.

Sixty-two species were recorded in June, 1915. They were:

Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Chickadee, Hairy Woodpecker, Cardinal, Meadowlark, Bluebird, Robin, Killdeer, Red-winged Blackbird, Bronzed Grackle, Flicker, Field Sparrow, Cowbird, Kingfisher, Towhee, Phoebe, Mourning Dove, Vesper Sparrow, Brown Thrasher, Chipping Sparrow, Chimney Swift, Spotted Sandpiper, House Wren, Baltimore Oriole, Warbling Vireo, Yellow Warbler, Catbird, Kingbird, Bobolink, Screech Owl, Barn Swallow, Orchard Oriole, Crested Flycatcher, Indigo Bird, Wood Pewee, Red-eyed Vireo, Dickcissel, Lesser Yellowlegs, Greater Yellowlegs, Yellow-billed Cuckoo, Alder Flycatcher, Cedarbird, Redstart, Maryland Yellowthroat, Nighthawk, Hummingbird, Canadian Warbler, Red-shouldered Hawk, Bank Swallow, Brown Creeper, Bobwhite, Grasshopper Sparrow, Acadian Flycatcher, Herring Gull, Blackburnian Warbler, Loggerhead shrike.

A very curious record, made on June 13, was that of the Brown Creeper. There was no record for this species in May, the bird having departed on April 20. In 1914 there was also no May record, the date of departure having been April 26. These various dates of migration show that the Brown Creeper is not to be looked for even in May. Who can account for its reappearance in June?

The most notable event in the writer's experience in June of this year was his trip to the sand-dunes in northern Indiana. In company with Dr. Nieuwland and another priest, on June 22, I went to a station seven miles beyond Michigan City, named Mineral Springs. From here a walk of about a mile brought us into the region of the dunes. These are a formation of sandhills—some nearly a hundred feet high—with deep gullies at long intervals. Formed by the wind blowing the sand inward from the shore of Lake Michigan, these dunes extend back probably a mile from the water's edge in several parallel ridges, covered mostly with pine trees. Looked at from the distance of a mile, the tops of the highest hills show the sand among the trees. This is perhaps the wildest part of Indiana. We met no person, nor saw any house, in the dune region. It seemed inspiring to think of the long years during which this unique formation has been going on, man playing no part in it, but nature carrying out her God-appointed laws in utter unobstructiveness.

You will be interested to learn just what species of birds were found among the dunes. The following is the list: Hairy Woodpecker, Redstart, Yellow Warbler, Blackburnian Warbler, Acadian Flycatcher, Vesper, Field, Song and Chipping Sparrows, Bluebird, Goldfinch, Blue Jay, Crow, Wood Pewee, Mourning Dove, Maryland Yellowthroat, Catbird, Kingbird, Chimney Swift, House Wren, Indigo Bird, Crested Flycatcher, and Herring Gull. Gulls first appeared when we were 20 miles from Michigan City.

I shall always recall this interesting trip to the sand-dunes as one of the most pleasurable I have ever made. What a pity, I have often thought, that the people of Indiana and the people of Chicago do not try to obtain this unique region for a national park.

In July fifty-three species were found this year. They were: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Cardinal, Meadowlark, Bluebird, Robin, Killdeer, Red-winged Blackbird, Bronzed Grackle, Field Sparrow, Flicker, Cowbird, Kingfisher, Towhee, Phoebe, Mourning Dove, Vesper Sparrow, Brown Thrasher, Chipping Sparrow, Chimney Swift, Spotted Sandpiper, House Wren, Baltimore Oriole, Warbling Vireo, Yellow Warbler, Catbird, Kingbird, Purple Martin, Bobolink, Screech Owl, Barn Swallow, Orchard Oriole, Crested Flycatcher, Indigo Bird, Wood Pewee, Red-eyed Vireo, Dickcissel, Greater Yellowlegs, Alder Flycatcher, Cedarbird, Maryland Yellowthroat, Hummingbird, Acadian Flycatcher, Loggerhead Shrike, Grasshopper Sparrow, Least Flycatcher, Scarlet Tanager, Yellow-billed Cuckoo.

Some of the more interesting of my observations, made in July, will now be given.—July 5, 4 p. m.—A Crested Flycatcher, perched on a wire fence, facing the breeze, and flying back, mostly to the ground, to catch flies; usually the bird perched sideways, to see the flies on both sides of the fence.—July 13.—Kingbirds bathing—flying from the tops of tall oaks and dipping into the water of a lake.—July 27.—Saw an albino Robin, which had been seen by number of persons about week previously. They reported it as a curious-looking white bird, but did not recognize it as a Robin. As soon as I saw the bird, which was all white (not snow-white, however), I recognized the right species at once. This Robin stayed in the same trees for a number of days longer, just

how long I can not say, for I left Notre Dame soon after the 1st of August.

August of 1915 had the largest number of species of any of the summer months—73. The greater part of this month was spent by the writer at Bankson Lake, four miles from Lawton, Mich. The country around this lake is very hilly, and deep woods abound in the neighborhood. From this difference in the character of the land, certain species of birds, very rare or unknown at this time of the year at Notre Dame, Indiana, are not uncommon in the vicinity of Bankson Lake. These rare species are: both kinds of Yellowlegs, Great Blue Heron, Gnatcatcher, Yellow-throated Vireo, Acadian Flycatcher, and Tufted Titmouse.

On the other hand, some common species found at Notre Dame are wholly absent or very rare near Bankson Lake. Such are: the Blue Jay, Meadowlark, Bronzed Grackle, Cowbird, House Wren, and Purple Martin. Some summers I have found the Purple Martin fairly common in this region, but this year there was only one record for August. The House Wren and Cowbird also had one record; in other years these species were seen oftener. The Bronzed Grackle, which had two records, was not found at all in August, 1914. The Meadowlark, loving a level country, is not seen on the hills of this section. Blue Jays, in small numbers, inhabited the more open woods near Bankson Lake some years ago, but for the past three summers they have not been observed here.

The most favorable place for observation near Bankson Lake is the deep woods, which are very extensive. Here such rare species as the Acadian Flycatcher, Yellow-throated Vireo, Tufted Titmouse and Gnatcatcher are common species. Here, too, the first warblers reappear toward the end of the month. This year I found fewer warblers in August than in 1914. There were seven: the Yellow Warbler, Blackburnian, Black and White, Redstart, Magnolia, Canadian, and Overbird.

The autumn migration begins in August, although a few species may not be found even in this month. Such are the Dickcissel and Loggerhead Shrike. My last record this year for the Shrike was July 15; for the Dickcissel, July 24. The Yellow Warbler departed on August 15; the Orchard Oriole, on August 28; the Maryland Yellowthroat, on August 21; the Grasshopper Sparrow, on Aug. 10. The Blackburnian, and Black and White

Warblers arrived on Aug. 22; the Magnolia Warbler and Red-breasted Nuthatch, on the 26th; the Canadian Warbler and the Ovenbird, on the 29th. On August 30, a flock of Bonaparte Gulls (about 20) appeared, flying over the lake and dipping frequently. This was my first record of this species.

The list of birds found in August is the following: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Chickadee, Hairy Woodpecker, Cardinal, Bluebird, Robin, Killdeer, Red-winged Blackbird, Bronzed Grackle, Field Sparrow, Flicker, Cowbird, Kingfisher, Towhee, Phoebe, Mourning Dove, Chipping Sparrow, Chimney Swift, Vesper Sparrow, Spotted Sandpiper, House Wren, Baltimore Oriole, Warbling Vireo, Yellow Warbler, Catbird, Kingbird, Purple Martin, Bobolink, Screech Owl, Barn Swallow, Orchard Oriole, Crested Flycatcher, Indigo Bird, Wood Pewee, Red-eyed Vireo, Greater, and Lesser, Yellowlegs, Alder Flycatcher, Cedarbird, Maryland Yellowthroat, Nighthawk, Hummingbird, Red-shouldered Hawk, Bank Swallow, Acadian Flycatcher, Grasshopper Sparrow, Least Flycatcher, Scarlet Tanager, Yellow-billed Cuckoo, Tree Swallow, Gnatcatcher, Mud Hen, Great Blue Heron, Eave Swallow, Ruffed Grouse, Whip-poor-whill, Brown Thrasher, Blackburnian, Black and White, Magnolia, and Canadian, Warblers, Tufted Titmouse, Redstart, Red-breasted Nuthatch, Overbird, Bonaparte Gull.

September of this year yielded the writer only 50 species, which was a much smaller number than is usual for this month. They were: Crow, Blue Jay, White-breasted Nuthatch, Red-headed Woodpecker, Goldfinch, Downy Woodpecker, Song Sparrow, Chickadee, Meadowlark, Bluebird, Robin, Killdeer, Bronzed Grackle, Field Sparrow, Flicker, Kingbird, Kingfisher, Phoebe, Mourning Dove, Chimney Swift, Spotted Sandpiper, House Wren, Warbling Vireo, Catbird, Purple Martin, Bobolink, Screech Owl, Barn Swallow, Indigo Bird, Wood Pewee, Lesser Yellowlegs, Cedarbird, Hummingbird, Least Flycatcher, Yellow-billed Cuckoo, Brown Thrasher, Redstart, Black and White Warbler, Magnolia Warbler, Red-breasted Nuthatch, Hermit Thrush, Golden-crowned Kinglet, Black-throated Green Warbler, White-throated Sparrow, Snowbird, Pine Warbler, Sapsucker, Ruby-crowned Kinglet, Brown Creeper, Nashville Warbler.

No record was made in September for the following species:

Hairy Woodpecker, Cardinal, Red-winged Blackbird, Cowbird, Towhee, Sparrow Hawk, Vesper Sparrow, Baltimore Oriole, Crested Flycatcher, Red-eyed Vireo, Alder Flycatcher, Night-hawk, Maryland Yellowthroat, Scarlet Tanager, Balckburnian Warbler. It is difficult to account for the absence of such common species as the Cowbird, Towhee, and Crested Flycatcher. And even in the case of the Baltimore Oriole, I have always made in former years at least one or two records of this species in September. To me nothing in the life of a bird seems more mysterious than its migratory habits. Nearly every species will show, at least occasionally, some marked irregularity in its migration.

The Spotted Sandpiper departed on Sept. 20; the Warbling Vireo, on Sept. 25; the Purple Martin, on Sept. 24; the Bobolink, on Sept. 13; the Barn Swallow, on Sept. 2; the Hummingbird, on Sept. 22; the Redstart, on Sept. 27. The Red-breasted Nuthatch arrived on Sept. 23; the Hermit Thrush, on Sept. 7; the Golden-crowned Kinglet, Black-throated Green Warbler, Snowbird, White-throated Sparrow, on Sept. 21; the Pine Warbler, on the 24th; the Sapsucker, on the 25th; the Ruby-crowned Kinglet, Brown Creeper, and Nashville Warbler, on the 28th.

Some observations made in September:—Sept. 5.—Black and White Warblers creeping and flitting in trees at the edge of an oak grove; saw only young birds. —Sept. 13.—First Meadowlarks reappeared—no record since Aug. 5, when I went to Bankson Lake, Mich.—Sept. 21.—Migration becoming stronger.—Sept. 22, Killdeers plentiful on the shore of a small lake.—Sept. 27.—Golden-crowned Kinglets numerous in oak groves and evergreens.—Sept. 28.—Least Flycatcher, on a wire fence—looks like a diminutive Phoebe.—Very faint call-note of a Catbird in bushes on a roadside.—Brown Thrashers, plentiful in bushes along a road; Ruby-crowned Kinglet and Nashville Warbler here too.

In October, 1915 I found forty-two species. These were: Crow, Blue Jay, White-breasted Nuthatch, Goldfinch, Downy Woodpecker, Song Sparrow, Chickadee, Hairy Woodpecker, Meadowlark, Bluebird, Robin, Killdeer, Bronzed Grackle, Field Sparrow, Flicker, Cowbird, Kingfisher, Mourning Dove, Chimney Swift, House Wren, Catbird, Wood Pewee, Least Flycatcher, Brown Thrasher, Hermit Thrush, Golden-crowned Kinglet, Snowbird, Pine Warbler, Ruby-crowned Kinglet, Brown Creeper, Myrtle Warbler, Yellow Palm Warbler, Fox Sparrow, Towhee,

Phoebe, White-throated, Lark, Savanna, White-crowned, Tree, Sparrows, Red-breasted Nuthatch, Connecticut Warbler.

Species that are usually seen in October, but failed to appear this year were: Red-headed Woodpecker, Cardinal, Red-winged Blackbird, Vesper and Chipping Sparrows, Cedarbird, Yellow-billed Cuckoo, and Screech Owl. The last record of the Red-headed Woodpecker was made on Sept. 19. As we saw at the beginning of our story, this species was present in all of the previous seasons of 1915. This woodpecker was also found in every month of 1914. This was the only year in which I observed the Red-headed Woodpecker throughout the year.

The migrants in October were: Meadowlark, departed on the 21st; Field Sparrow, on the 27th; Flicker, on the 11th; Cowbird, on the 26th; Chimney Swift, on the 2d; Wood Pewee, on the 8th; Least Flycatcher, on the 7th; Brown Thrasher, on the 10th; Hermit Thrush, on the 19th; Ruby-crowned Kinglet, on the 18th; Yellow Palm Warbler, on the 6th; Fox Sparrow, on the 13th; Towhee, on the 20th; Phoebe, on the 20th; White-throated Sparrow, on the 23d; White-crowned Sparrow, on the 17th; Red-breasted Nuthatch, on the 13th; Connecticut Warbler, on the 15th. The Tree Sparrow, the last of autumn migrants to arrive from the north, returned this year on October 25.

October observations.—Oct. 5.—Goldfinches in autumn plumage.—A few notes of a Song Sparrow.—Yellow Palm Warbler in a hedge along a roadside.—Oct. 9.—Red-breasted Nuthatches, plentiful in an oak grove.—Oct. 14.—Saw an albino Field Sparrow—white on rump and sides.—Oct. 15.—Snowbirds becoming plentiful.—Oct. 16, 8:30 am.—Bright and warm.—Birds plentiful and in song.—The air filled with the notes of Bluebirds.—Goldfinches and Towhees, everywhere.—Oct. 19.—Bright and warm.—Meadowlarks singing loud.

My record for November, 1915 shows only 18 species. These were: Crow, Blue Jay, White-breasted Nuthatch, Goldfinch, Downy Woodpecker, Song Sparrow, Cardinal, Bluebird, Robin, Killdeer, Bronzed Grackle, Kingfisher, Golden-crowned Kinglet, Snowbird, Brown Creeper, Myrtle Warbler, Tree Sparrow, Chickadee.

The species most abundant in November were: Crow, Blue Jay, White-breasted Nuthatch, Snowbird, and Chickadee. The less abundant species were: Goldfinch, Killdeer, Downy Wood-

pecker, Tree Sparrow, Bronzed Grackle, Brown Creeper, Golden-crowned Kinglet. The very rare species were: Myrtle Warbler, with two records—the 19th and 23d; the Cardinal, Bluebird, Robin, with one record.

The migrants in November were: Bluebird, and Robin, on the 4th; Kingfisher, on the 23d; Golden-crowned Kinglet, on the 11th; Myrtle Warbler and Killdeer on the 24th. The Golden-crowned Kinglet reappeared on Dec. 20, the only winter record I have ever made for this species. The Cardinal, though not a migrant, was not found after Nov. 10.

Some observations made in November.—Nov. 10, Golden-crowned Kinglets flitting about in a tree, and always looking upwards, probably for insects; did not remain long in one tree.—Nov. 14, Chickadees, plentiful in orchards and woods. They move quickly from tree to tree, feeding on larvae **on** the bare branches.—Nov. 15, first snowfall last night.—A Killdeer on the shore of a lake; the first time I remember seeing this species in the snow.

I shall now summarize the results this year's observations of bird life. The total number of species seen in 1915 was 117, which was five more than the number found in 1914. Species that were not present in 1915 were: Purple Finch, Northern Shrike, Snowflake, Pine Grosbeak, Black-billed Cuckoo, Wilson Snipe, Wood Thrush, Winter Wren, Carolina Wren, Yellow-breasted Chat, Swamp Sparrow.

In eleven years I have made only one record of the Yellow-breasted Chat. The Carolina Wren appeared in May and June, 1913, but has not been recorded since then. The Winter Wren is a very rare species at Notre Dame, several records being the result of years of observation. I have often wondered why the Wood Thrush is not a common species with us, only an occasional record is made in spring and autumn. The Black-billed Cuckoo may be found, I am sure, every summer, but it is rare compared with the Yellow-billed Cuckoo. Such species as the Pine Grosbeak and the Northern Shrike may be regarded as accidental visitants to our locality. The Purple Finch is also very erratic in its movements, and may not be found at all in most years. The Snowflake may also be placed in the class of irregular visitants.

The very interesting, but most mysterious, migration of our birds has, in this paper, been necessarily treated in a desultory fashion. Fulness of detail and constant comparison of the various

dates of migration can be given only in special articles on the subject, and without such methodical study no satisfactory results can be obtained. I have in many published articles in the AMERICAN MIDLAND NATURALIST attempted a complete statement of the migratory habits of the birds of Notre Dame, Indiana. To these articles, then, I refer my auditors for an exact account of present conditions of migration.

Thus the story of our birds ends. To have done full justice to the subject would require a volume. I have aimed at giving only a summary of my observations—and this mostly in what related to the distribution and migration of our birds. The more interesting, but not more important, part of a bird's life—its habits—I have barely touched upon, chiefly because hitherto my study of birds' habits has been incidental, and can not be thoroughly done without neglecting the other departments. I hope to take up this part of ornithology when I shall have finished my study of the migration and distribution of our birds.

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—VI.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—VI.

With Notes by J. Lunell.

504. *Biauricula intermedia* (Guersent) Lunell.

Iberis intermedia Guersent. Bul. Soc. Philom. III, 169, t. 21, (1811).

Occasionally escaped. Leeds.

LEPIDIUM Dioscorides II: 166. Plinius XX: 17. Tour. Els. 184. (1694). Anguillara, Matthioli, etc. Linn. Syst. (1735), Gen. (1737 and 1754).

505. *Lepidium densiflorum* Schrader, Ind. Sem. Gott. 4. (1835).

Lepidium intermedium A. Gray, Man. Ed. 2. (1856).

Leeds, Sheyenne.

506. *Lepidium ramosissimum* A. Nels. in Bull. Torr. Bot. Club. 26: 124. (1899.)

Leeds.

CAMELINA Ruellius, Nat. Stirp. 326. (1543). Crantz, Stirp. Austr. I: 18. (1762). *Myagrum* Diosc.

507. *Camelina sativa* Crantz, l. c.

Myagrum sativum Linn. Sp. Pl. 641. (1753).

Leeds, Butte.

NESLIA Desv. Journ. Bot. 3: 162. (1814).

508. *Neslia paniculata* (Linn.) Desv. l. c.

Myagrum paniculatum Linn. Sp. Pl. 641. (1753).

Leeds, St. John, Minot.

SOPHIA Brunfels, Hist. 3: 170. (1543). Lobelius, Icon. 738. (1581). Ray. Hist. 1. 812. (1686). Adans. Fam. des Pl. II. 417. (1763).

509. *Sophia Chirurgorum* Lobelius Obs. 426 (1576); also Trew. Herb. Blackw. V, t. 440 (1765).

Sisymbrium Sophia Linn. Sp. Pl. 659. (1753).

Descurainia Sophia Webb.; Prantl in Engler & Prantl, Nat. Pfl. Fam. 3: Abth. 2. 192. (1892).

Sophia Lobelii Rupr. Fl. Cauc. 88. (1869).

Sophia Sophia (Linn.) Britt. & Br. Ill. Fl. II: 145. (1897).

The use of the same word to signify both genus and species for a plant is objectionable, and it would simply be unfair not to make the same allowance for varieties. How would this sound: *Sophia Sophia* var. *Sophia*?!
Leeds: Kulm (Brenckle).

510. *Sophia brevipes* (Nutt.) Rydb.

Sisymbrium canescens brevipes Nutt.

Leeds, Peninsula of Lake Ibsen; Kulm (Brenckle).

511. *Sophia filipes* (A. Gray) Heller, in Bull. Torr. Bot. Club. 24: 311. (1897).

Dry bottom of Willow Creek near Dunsieith.

512. *Sophia intermedia* Rydb. in Mem. N. Y. Bot. Gard. I: 184. (1900).

Leeds, Pleasant Lake, Towner.

NORTA Adanson, Fam. des Pl. 417. (1763).

513. *Norta altissima* (Linn.) Britt. Ill. Fl. 2 ed. II. (1913).

Sisymbrium altissimum Linn. Sp. Pl. 659. (1753).

Leeds, and everywhere in the western part of the state.

CHEIRINIA Link, Enum. Hort. Berol. II: 170. (1820).

514. *Cheirinia cheiranthoides* (Linn.) Link. l. c.

Erysimum cheiranthoides Linn. Sp. Pl. 661. (1753).

Leeds, Peninsula of Lake Ibsen.

515. *Cheirinia cheiranthoides* var. *prostrata* Lunell.

Cheiranthus cheiranthoides var. *prostratus* Lunell, in Bull. Leeds Herb. no. 2, p. 6. (1908).

Rolette County: near Dunseith.

516. *Cheirinia inconspicua* (S. Wats.) Rydb. Bull. Torr. Bot. Club 39: 323. (1912).

Erysimum parviflorum Nutt.; T. & G. Fl. N. Am. I: 95. (1838). Not Pers. (1807).

Erysimum asperum inconspicuum S. Wats. in King, Geol. Expl. 40th Par. 5: 24. (1871).

In planted farm groves, etc. Leeds.

517. *Cheirinia syrticola* (Sheldon) Lunell.

Erysimum syrticum Sheldon in Bull. Torr. Bot. Club. 20: 285. (1893).

On the open prairie. Leeds and everywhere.

518. *Cheirinia aspera* (Nutt.) Rydb. Bull. Torr. Bot. Club 39: 323. (1912).

Cheiranthus asper Nutt. Gen. Pl. 2: 69. (1818).

Erysimum asperum DC. Reg. Veg. Sept. 2: 505. (1821).

Butte, Oberon, Towner. Minot.

1201. *Cheirinia elata* (Nutt.) Rydb. Bull. Torr. Bot. Club. 39: 327. (1912).

Erysimum elatum Nutt.; T. & G. Fl. N. A. I: 95. (1838).

Cheiranthus elatus (Nutt.) Greene, Pittonia III: 135. (1896). Thorne.

ERYSIMUM Dioscorides II: 187. Plinius Hist. Nat. Linn. Syst. (1735), Gen. (1737 and 1754). Not Theophrastus = *Polygonum Fagopyrum* Linn. *Sisymbrium* of modern authors, not of the ancients and Dioscorides, which is a *Mentha*.

519. *Erysimum vulgare* Bauhin (Pinax 100. 1623), var. *leiocarpum* (DC.) Lunell.

Sisymbrium officinale leiocarpum DC. Prodr. I: 191. (1824). Leeds, Devils Lake.

HESPERIS Plinius XXI: 7. Tour. Els. 190. (1694).

520. *Hesperis hortensis* C. Bauhin, Pinax 202 (1623), also *Phytopinax* 379. (1596).

Hesperis matronalis Linn. Sp. Pl. 663. (1753).

Kulm (Brenckle).

RAPHANUS Theophr. Hist. 7: 4 Diosc. 2: 138. and of all later authors.

Radicula Dodonaeus Pempt. 666. (1583).

521. *Raphanus sativus* Linn. Sp. Pl. 669. (1753).

Escaped. Leeds, Pleasant Lake.

BARBAREA Lobelius, Obs. 104. (1575), Dodonaeus, Pempt. 5: 4: 20. (1583), R. Br., Ait. Hort. Kew. ed. 2. 4: 109. (1812)).

522. *Barbarea vulgaris* R. Br., l. c.

Fargo (Cl. Waldron).

TURRITIS Lobelius, Icones (1591), Dillenius, Gen. 120. (1719), Linn. Syst. (1735).

523. *Turritis hirsuta* Linn. Sp. Pl. 666. (1753).

Arabis hirsuta (Linn.) Scop. Fl. Carn. ed. 2: II: 30. (1772).

Leeds, Butte, Sheyenne.

524. *Turritis brachycarpa*. T & G., Fl. N. Am. I: 79. (1838).

Arabis brachycarpa (T. & G.) Britton, Mem. Torr. Bot.

Club V: 174. (1894).

Devils Lake.

525. *Turritis retrofracta* (Graham) Lunell.

Arabis retrofracta Graham, Edinb. Phil. Jour. 349. (1829).

Dunsieth, Towner, Minot.

DRACAMINE Nwd. Am. Midl. Nat. IV: 40. (1915).

Cardamine Clusius, Haller, Lobelius, Linn. Syst. (1735), Gen. (1737 and 1754). Tour. Els. 191. (1694), *not* Dioscorides, which is *Sisymbrium Nasturtium aquaticum* Linn.

526. *Dracamine pennsylvanica* (Muhl.) Nwd. l. c.

Cardamine pennsylvanica Muhl.; Willd. Sp. Pl. III: 486. (1800)

Walhalla (Bergman).

CONRINGIA Link. Enum. Pl. 2: 172. (1822).

527. *Conringia orientalis* (Linn.) Dum. Fl. Belg. 123. (1827).

Brassica orientalis Linn. Sp. Pl. 666. (1753).

Conringia perfoliata Link., l. c.

Leeds, Butte, Pleasant Lake.

ERUCA Mill. Gard. Dict. ed. 8. no. 1. (1768). Tour. Els. 193. (1694).

528. *Eruca latifolia* Bauhin Prod. 39, (1620).

Brassica Eruca Linn. Sp. Pl. 667. (1753).

Eruca Eruca (Linn.) Britt. Ill. Fl. ed. 2. II: 192. (1913).

Eruca sativa Mill. l. c.

Aneta (John Lundquist).

BRASSICA Cicero, Cato, Plinius XIX: 8, XX: 9.

529. *Brassica campestris* Linn. Sp. Pl. 666. (1753).

Fargo (Cl. Waldron).

SINAPIS Dioscorides 2: 154. Theophrastus 7: 3 and 6, Plinius XIX: 68, XX: 22, Brunfels, Dodonaeus, etc., Tour. Éls 193. (1694), Linn. Syst. (1735), Gen. (1737 and 1754).

530. *Sinapis nigra* Linn. Sp. Pl. 668. (1753).

Brassica nigra (Linn.) Koch in Roehl, Deutsche Fl. ed. 3, 4: 713. (1833).

Leeds.

531. *Sinapis arvensis* Linn. Sp. Pl. 668. (1753).

Brassica Sinapistrum Boiss. Voy. Espagne, 3: 39. (1839).

Brassica arvensis (Linn.) B. S. P. Prel. Cat. N. Y. (1888).

Leeds.

HIRSCHFELDIA Fritsch, Exkursfl. Oesterr. ed. 2, p. 265. (1909).

Erucastrum Presl., undesirable name as built on *Eruca*.

532. *Hirschfeldia Pollichii* (Schimp. & Spenn.) Fritsch, Exkursfl., 1. c.

Erucastrum Pollichii Schimp. & Spenn., Fl. Freib. III, p. 946. (1829).

Fargo (Cl. Waldron). Well established.

533. *Matthiola* sp.

Occasional escape from cultivation, Leeds.

Family 52. **CAPPARIDEAE** Vent. Tabl. III: 118. (1794.)

JACKSONIA Raf., Med. Repos. V. 352. (1808), not R. Br. in Ait. Hort. Kew. III: 12. (1811).

Polanisia Raf. Am. Month. Mag. 267. (1818), also Journ. de Phys. 98. (1819).

534. *Jacksonia trachysperma* (T. & G.) Greene, Pittonia 2: 175. (1891).

Polanisia trachysperma T. & G. Fl. N. A. I: 669. (1840).

Leeds, Narrows.

535. *Jacksonia trifoliata* Raf., Med. Repos. N. Y. 1. c.

Polanisia graveolens Raf. Journ. de Phys., 1. c.

Polanisia dodecandra B. S. P. Cat. N. Y. 6: (1888), not *Cleome dodecandra* Linn.

In the eastern part of the state.

PERITOMA DC. Prodr. I: 237. (1824).

536. **Peritoma serrulatum** (Pursh) DC., l. c.
Cleome serrulata Pursh, Fl. Am. Sept. 441. (1814)
Cleome integrifolia T. & G. Fl. N. Am. I: 122. (1838).
 Leeds, Hurricane Lake.

Family 53. **RESEDACEAE** S. F. Gray, Nat. Arr. Brit. Pl. 2: 665. (1821).

RESEDA Linn. Sp. Pl. 448. (1753).

537. **Reseda odorata** Linn., l. c.
 Escaped from cultivation. Leeds.

Order 24. CALOPHYTAE.

Bartling, Ord. Nat. Pl. 330, 398. (1830).

Family 54. **PENTHORACEAE** Rydl. N. Am. Fl. 22: 75. (1905).

PENTHORUM Gronovius, Fl. Virg. 51. (1739). Linn.: Gen. (1742), Act. Ups. (1744).

538. **Penthorum sedoides** Linn. Sp. Pl. 432. (1753).
 Fargo (Bergman).

Family 55. **PARNASSIEAE** S. F. Gray, Nat. Arr. Brit. Pl. II: 623. (1821).

PARNASSIA Tour. Els. 212. (1694), I. R. H. 246. (1700).
 Linn. Syst. (1735), Gen. (1737 and 1754), Haller, Helv. 316. (1742).

539. **Parnassia caroliniana** Michx. Fl. Bor. Am. I: 184. (1803)
 Towner.

540. **Parnassia palustris** Linn. Sp. Pl. 273. (1753).
 Towner, Butte.

Family 56. **SAXIFRAGEAE** Vent., Tab. III: 277. (1799).
HEUCHERA Linn., Syst. (1735), Gen. (1737 and 1754),
 Hort. Cliff. 82. (1737).

541. **Heuchera hispida** Pursh, Fl. Am. Sept. 188. (1814).
 Leeds, Butte.

Family 57. **GROSSULARIACEAE** Dumort. Anal. Fam. Fl. 37. (1829).

GROSSULARIA Ruellius, Hist. Stirp. 213. (1543). Clusius, Hist. (1605). Tour. Els. 501. (1694), I. R. H. 639. (1700), Miller, Gard. Dict. Abr. (1754).

542. **Grossularia saxosa** (Hook.).
Ribes saxosum Hook. Fl. Bor. Am. I: 231. (1833).
 Devil's Lake, Turtle Mountains, Minot.

COREOSMA Spach, Veg. Syst. VI: 154. (1838), also Ann. Nat., Ser. II, IV. 2. (1835).

543. **Coreosma prostata** (L'Her.) Lunell.

Ribes prostratum L'Her, Stirp. Nov. I: 3, Pl. 2, (1784).

Turtle Mountains: Fish Lake.

544. **Coreosma americana** (Miller) Nwd. Am. Midl. Nat.

IV: 60. (1915).

Coreosma florida Spach, Veg. Syst. VI: 157. (1838).

Ribes floridum L'Herit. Stirp. Nov. I, 4. (1784).

Ribes americanum Miller, Gard. Dict. ed. 8. (1768).

Peninsula of Lake Ibsen, Turtle Mountains.

545. **Coreosma tristis** (Pall.) Lunell.

Ribes triste Pall. *Ribes rubrum* var. *subglandulosum* Maxim.

Pleasant Lake, Turtle Mountains.

546. **Coreosma longiflora** (Nutt.) Lunell.

Ribes longiflorum Nutt. Ker. Bot. Reg. 2: pl. 125. (1816).

Medora, Sentinel Butte (Bergman).

Family 58. **SPIRAEACEAE** Loiseleur Delongchamps, Man.

Pl. Indig. I: 188. (1818).

SPIRAEA Theophrastus I: 23, Bauhin, Pinax 475. (1623),

Clusius, Hist. I: 80. (1605), Tour. Els. 490. (1694).

547. **Spiraea alba** Duroi, Harb. Baumz. II: 430. (1772).

Spiraea salicifolia lanceolata T. & G., Fl. N. Am. I: 145. (1840).

Pleasant Lake.

548. **Spiraea latifolia** (Ait.) Borck. Handb. Forstb. 1871. (1803)

Spiraea salicifolia latifolia Ait. Hort. Kew 2: 198. (1789).

Turtle Mountains.

549. **Spiraea simplex** Greene, Leaflets II. 157. (1911).

Leeds, Butte.

505. **Spiraea Vanhouttei** Zabel. Witm., Gartenzezeit. III,

496 (1884).

Plant under cultivation, with a self-spreading tendency. Leeds.

Family 59. **DRYADEAE** Vent. Tabl. III. 346. Also Bartling,

Ord. Nat. Pl. 230. (1830).

PENTAPHYLLUM Dioscorides 4: 72, Theophrastus, Hist.

9: 14.

551. **Pentaphyllum concinnum** (Richards.) Nwd. & Lll.

Potentilla concinna Richards., Frankl. 1st Journ. 739. (1823).

Potentilla humifusa Nutt. Gen. I, 310. (1818).

Leeds, Butte; Dickinson (Cl. Waldron).

552. **Pentaphyllum pulcherrimum** (Lehm.) Nwd. & Lll.

Potentilla pulcherrima Lehm. Nov. Stirp. Pugill. 2: 10. (1830).

Leeds, Oberon.

553. **Pentaphyllum viridescens** (Rydb.) Lunell.

Potentilla viridescens Rydb. (Monog. Pot.) Mem. Dept. Bot. Columbia Univ. 2: 43. (1898).

Butte.

554. **Pentaphyllum pennsylvanicum** (Linn.)

Potentilla pennsylvanica Linn. Mant. Pl. 76 (1767).

Leeds.

555. **Pentaphyllum strigosum** (Pursh).

Potentilla strigosa (Pursh) Pall.; Tratt. Rosac. Monogr. 4: 31. (1824).

Potentilla pennsylvanica strigosa Pursh. Fl. Am. Septentr. 356. (1814).

Potentilla arachnoidea Dougl.; Rydb. N. Amer. Fl. 22: 350. (1908).

Leeds, Pleasant Lake.

556. **Pentaphyllum bipinnatifidum** (Dougl.)

Potentilla bipinnatifida Dougl.; Hook. Fl. Bor. Am. I: 188. (1833).

Potentilla pennsylvanica bipinnatifida (Dougl.) T. & G. Fl. N. A. I: 438. (1838).

Leeds, Pleasant Lake.

557. **Pentaphyllum platylobum** (Rydb.)

Potentilla platyloba Rydb. Fl. of Colo. 184. (1906).

Potentilla bipinnatifida platyloba Rydb. Bull. Torr. Cl. XXX: 143. (1906).

Butte.

558. **Pentaphyllum argyreum** (Rydb.).

Potentilla argyrea Rydb. N. Am. Fl. XXII: 341. (1908).

Antler (Bergman).

559. **Pentaphyllum effusum** (Dougl.).

Potentilla effusa Dougl. :Lehm. Nov. Stirp. Pug. 2: 8. (1830).

Dunsieth.

560. **Pentaphyllum glabrellum** (Rydb.).

Potentilla glabella Rydb. Mem. Columb. Univ. II: 94. (1898).

Butte (extinct).

561. **Pentaphyllum Hippiantum** (Lehm.).

Potentilla Hippiana Lehm. Nov. Stirp. Pugill. 2: 7. (1830).

Potentilla leucophylla Torr. Am. Lyc. N. Y. 2: 197. (1827).
not Pall. (1773).

Potentilla pennsylvanica Hippiana T. & G. Fl. N. A. I: 438. (1849).

Butte, Sheyenne.

Pentiphyllum is a good genus name for the species here numbered 551-553. For the following (numbered 554-561) it is just as fitting as *Chrysanthemum* is for those of its species having white rays!

POTENTILLA Brunfels in C. Bauhin Pinax. 321. (1623). Matthioli, Fuchsius Hist. and Stirp. (1546), Stirp. Hist. 355. (1549), Caesalpinus, De Plantis 557. (1558).

562. *Potentilla Anserina* Linn. Sp. Pl. 495. (1753).

Argentina vulgaris Lam., Fl. Fr. 3. (1778).

Leeds.

563. *Potentilla Anserina concolor* Rydb. Mem. Bot. Col. Coll. 2: 160. (1898).

Argentinea argentea Rydb. Bull. Torr. Club. 33: 143. (1906), seems to possess a different, more permanently and deeply silvery dressing, covering all the leaves. In our plant it often happens that some of the leaves are green above, or merely in part silvery.

Leeds.

564. *Potentilla Anserina grandis* T. & G.

Leeds, Butte.

TRIDOPHYLLUM Necker Els. 2: 93. (1790).

565. *Tridophyllum monspeliense* (Linn.) Greene, Leaflets I: 189. (1906).

Potentilla monspeliensis Linn. Sp. Pl. 499. (1753).

Leeds, Butte, Towner.

566. *Tridophyllum pentandrum* (Engelm.) Greene, l. c.

Potentilla pentandra Engelm.; T. & G. Fl. N. A. I: 447. (1840).

Potentilla rivalis var. *pentandra* S. Wats. Proc. Am. Acad. 8: 553. (1873).

Leeds, Butte, Bottineau.

567. *Tridophyllum leucocarpum* (Rydb.) Greene, l. c.

Potentilla leucocarpa Rydb. in Britt. Ill. Fl. U. S. and Canada, Vol. II: 212. (1897).

Potentilla milligrana Engelm.; Lehm. Delect. Sem. Hort. Hamb. 1849. Add. 12. (1849). Not Dougl. 1833.

Potentilla rivalis var. *milligrana* S. Wats. Proc. Am. Acad. 8: 553. (1878).

Leeds, Butte.

568. **Tridophyllum paradoxum** (Nutt.) Greene, l. c.
Potentilla paradoxa Nutt.; Torr. & Gray, Fl. N. Amer. I:
 437. (1840).
Potentilla supina Am. Authors, not Linn.
 Leeds, Peninsula of Lake Ibsen, Devils Lake.
569. **Tridophyllum Nicolletii** (S. Wats.) Greene, l. c.
Potentilla supina var. *Nicolletii* S. Wats. Proc. Am. Acad.
 8: 553. (1873).
Potentilla Nicolletii Sheldon, Bull. Nat. Hist. Surv. Minn.
 9: 16. (1894).
 Leeds.
- DRYMOCALLIS** Fourr. Am. Soc. Linn. Lyon. II: 16.
 371. (1868).
 570. **Drymocallis arguta** (Pursh) Rydb. Mem. Dept. Bot.
 Columbia Univ. 2: 192. (1898).
Potentilla arguta Pursh Fl. Am. Sept. 736. (1814).
Geum agrimonioides Pursh, l. c. (1814), not *P. agrimonioides*
 Bieb. (1808).
 Leeds, Butte.
- DASIPHORA** Rafinesque, Ant. Bot. 167. (1838).
Pentaphylloides Morison, Ox. 2: 193. (1715), name undesirable
 as built on *Pentaphyllum*.
571. **Dasiphora fruticosa** (Linn.) Rydb. Mem. Bot. Columbia
 Coll. 2: 188. (1898).
Potentilla fruticosa Linn., Sp. Pl. 495. (1753).
 Sentinel Butte (Bergman).
- CHAMERHODOS** Bunge (*χαμαί* to the ground, *ρόδος* a
 rose). This is a poor name! How could this unsightly plant with
 its almost microscopical flowers impress upon the author's mind
 the idea of its resemblance to a rose?
 Leeds, Butte, Towner, Dunsieith.
572. **Chamaerhodos erecta** Bunge, in Ledeb. Fl. Alt. I:
 430. (1829).
FRAGARIA Cuba, Hort. Sanit. (15th century). Brunfels,
 Herb. Viv. Ic. (J. de Manliis) 2: 173. (1531). Tour. Els. 245.
 (1694), Linn. Gen. (1737 and 1754).
573. **Fragaria platypetala** Rydb. Mem. Dept. Bot. Columbia
 Univ. 2: 177. (1898).
 Devil's Lake, Turtle Mountains.

10 306

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THE AMERICAN MIDLAND NATURALIST

Devoted to Natural History, Primarily
that of the Prairie States

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J. A. NIEUWLAND, C. S. C., Ph. D., Sc. D., Editor

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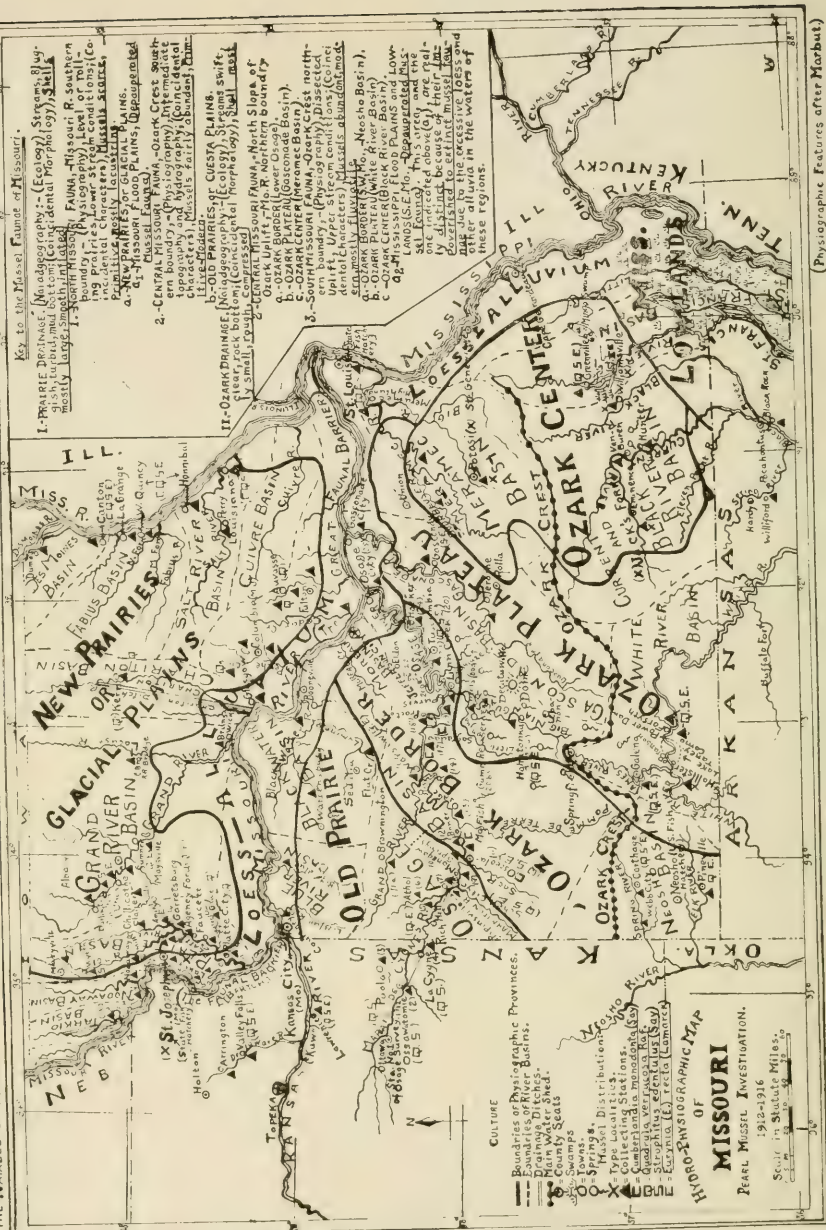
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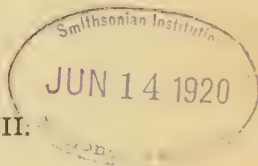
NO. 10.

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—VII.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—VII.

With Notes by J. Lunell.



574. *Fragaria platypetala quadrifolia* Lunell in Am. Midl. Nat. Vol. II: 123. (1911).

Turtle Mountains: St. John.

575. *Fragaria ovalis* (Lehm.) Rydb. Bull. Torr. Club 33: 143. (1906).

Leeds, Butte.

576. *Fragaria ovalis quinata* Lunell in Am. Midl. Nat. Vol. II: 123. (1911).

Leeds.

577. *Fragaria glauca* (Wats.) Rydb. l. c. 183.

Fragaria ovalis glauca (Wats.) A. Nels. in Coult. Rocky Mt. Bot. 252. (1909).

Leeds, Butte.

578. *Fragaria bracteata* Heller, Bull. Torrey Bot. Club 25: 194. (1898).

Towner.

ERYTHROCOMA Greene in Leaflets Vol. I: 175. (1906).

579. *Erythrocoma triflora* (Pursh) Greene, l. c. 177.

Geum triflorum Pursh, Fl. Am. Sept. 736. (1814), but not *Geum ciliatum* Pursh l. c. 352, which is a different species growing in the far west (vide *E. ciliata* (Pursh) Greene, l. c. 175).

Leeds, Butte.

GEUM Plinius XXVI: 7. Gesner, Hort. Germ. 260. (1561), also Turner.

580. *Geum canadense* Jaquin, Hort. Vind. 2: 82. pl. 185. (1772).

Geum Carolinianum Walt. Fl. Car. 150. (1788).

Geum album Gmel. Syst. 2. 861. (1791).

Pleasant Lake, Jamestown.

581. *Geum macrophyllum* Willd. Enum. 557. (1809).

Along Missouri River. Peninsula of Lake Ibsen.

582. *Geum strictum* Ait. Hort. Kew. 2: 217. (1789).

Butte, Turtle Mountains.

RUBUS Virgilius, Ecl. 3: 89. Georg. 3315. Plinius 16: 37, 24: 14. Columella 3: 11, 4: 31. 7: 6.

583. *Rubus americanus* (Pers.) Britt. Mem. Torr. Bot. Club 5: 185. (1894).

Rubus triflorus Richardson, Franklin Journ. ed. 2. App. 19. (1823).

Rubus saxatilis var. *americanus* Pers. Syn. 2: 52. (1807).

Turtle Mountains.

BATIDAEA Greene, Leaflets I: 238. (1906).

584. *Batidaea vulgaris* Nwd. Am. Midl. Nat. Vol. IV. p. 70. (1915).

Batos idaeus Diosc. 4: 39. *Rubus idaeus* Plinius 16: 37, Tragus, Linn. Sp. Pl. 493. (1753). The species name *idaeus* is rejected, as it would be an ugly part repetition of the genus name.

Leeds, Peninsula of Lake Ibsen, Turtle Mountains.

Fam. 60. *SANGUISORBEAE* Spreng. Anleit. ed. 211. 861. (1818).

EUPATORIUM Dioscorides 4: 41. Tragus, Cordus, etc. Plinius 25: 6. *Agrimonia* Brunfels, Dodonaeus, Tour. Els. 251. (1694). I. R. H. 301. (1700). Linn. Gen. (1737 and 1754).

585. *Eupatorium Brittonianum* (Bickn.) Nwd. & Lll.

Agrimonia Brittoniana Bickn. Bull. Torr. Bot. Club 23: 517. (1896).

Butte, Turtle Mountains.

Family 61. *ROSACEAE* B. Jussieu, Trianon (1759); also A. Jussieu, Gen. IXX. 374. (1789).

ROSA Virgilius 4: 134. Aen. 12: 69. Culex 308. Tour. Els. 500. (1694), Linn. Syst. (1735).

586. *Rosa heliophila* Greene, Leaflets II: 132. (1911).

Rosa pratincola Greene, Pittonia IV: 13. (1899), not A. Braun (1888)

Leeds, Butte, Pleasant Lake.

587. *Rosa heliophila* var. *foliosissima* Lunell, in Am. Midl. Nat. Vol. II: 157. (1912).

York.

588. *Rosa Lunellii* Greene, Leaflets II: 132. (1911).
Devil's Lake.

589. *Rosa gratiosa* Lunell, Am. Midl. Nat. II: 154. (1912).
Devil's Lake, Turtle Mountains, Pleasant Lake.

590. *Rosa gratiosa* var. *dulcissima* Lunell, in Am. Midl. Nat. Vol. III: 137, (1913).

Rosa dulcissima Lunell, Am. Midl. Nat. II: 287. (1912)
Pleasant Lake, Turtle Mountains.

591. *Rosa polyanthema* Lunell in Am. Midl. Nat. Vol. III: 138. (1913).

On the banks of the Missouri at Bismarck.

592. *Rosa deserta* Lunell, Am. Midl. Nat. II: 156. (1912).
Pleasant Lake, Willow City.

593. *Rosa poetica* Lunell, Am. Midl. Nat. III: 139. (1913).
On the banks of the Missouri at Bismarck.

594. *Rosa terrens* Lunell, Am. Midl. Nat. II: 155. (1912).
Pleasant Lake.

595. *Rosa subnuda* Lunell, Am. Midl. Nat. II: 153. (1912).
Peninsula of Lake Ibsen, Butte.

596. *Rosa naiadum* Lunell, Am. Midl. Nat. III: 139. (1913).
River banks: Minot, Jamestown.

There are still in the state roses not mentioned here. All wild roses seem to possess a remarkable power to resist extinction through "improvement" of the land.

Family 62. **POMIFERAE** Ray, Meth. 30. (1682).

AUCUPARIA Rivinus ex Rupp. Fl. Jen. 190. (1726). Medicus, Geschichte 86. (1793).

597. *Aucuparia sylvestris* Medik. Gesch. 86. (1793).

Sorbus Aucuparia Linn. Sp. Pl. 477. (1753).

Leeds.

AMELANCHIER. Pena and Lobelius Obs. 60 Adv. 441. (1576), also Medic. Phil. Bot. 155. (1789).

598. *Amelanchier macrocarpa* Lunell, in Am. Midl. Nat. III: 143. (1913).

Pleasant Lake, Butte, Devils Lake.

OXYACANTHA Diosc. I: 105. Lobelius, J. Bauhin, etc.

599. *Oxyacantha chrysocarpa* (Ashe) Lunell.
Crataegus chrysocarpa Ashe.
 Peninsula of Lake Ibsen, Pleasant Lake, Towner, Minot.
 Family 63. **DRUPACEAE** Linn. Phil. Bot. 31. (1751) and (1754).
PRUNUS Dioscorides Mat. Med. 137. Tour. Els. 494. (1693), Linn. Gen. (1737 and 1755), in part.
 600. *Prunus americana* Marsh. Arb. Am. III. (1785).
 Peninsula of Lake Ibsen, Devil's Lake, Turtle Mountains.
 601. *Prunus nigra* Ait. Hort. Kew. 2: 165. (1789).
 Turtle Mountains: Fish Lake, St. John.
CERASUS Theophrastus, Hist. 3: 13, Tour. Els. 625. (1694). Linn. Syst. (1735).
 602. *Cerasus Besseyi* (Bailey) Lunell.
Prunus Besseyi Bailey, Bull. Cornell. Agric. Exp. Sta. 70. 261, (1894).
 Butte (cultivated); Emmons Co.: Beaver Creek Valley (Brenckle).
 603. *Cerasus pennsylvanica* (Linn. f.) Loisel. Arb. 9. (1801-19).
Prunus pennsylvanica Linn. f. Suppl. 252. (1781).
 Turtle Mountains.
PADUS Theophrastus, Hist. 4: 1. C. Bauhin etc. Linn. Syst. (1735), Gen. (1737), Miller. Gard. Dict. abr. ed. 4. (1754).
 604. *Padus melanocarpa* (A. Nels.) Shafer in Britt. & Shaf. N. Amer. Trees 504. (1908).
Cerasus demissa melanocarpa A. Nels. Bot. Gaz. 34: 25. (1903).
Prunus melanocarpa (A. Nels.) Rydb. Bull. Torr. Bot. Club 33: 143. (1906).
 Peninsula of Lake Ibsen, Butte, Pleasant Lake.
 605. *Padus virginiana* (Linn.) Miller, Gard. Dict. ed. 8. no. 3. (1768).
Prunus virginiana Linn. Sp. Pl. 473. (1753).
 Turtle Mountains.
 Family 64. **LOMENTACEAE** Linn. Phil. Bot. (1751), pro maiore parte!
Mimoseae Robert Brown, Flander's Voyage, Bot. II, App. III. 551. (1814), also Bartling, Ord. Nat. Pl. 231 & 416. (1830).
Mimosaceae Reichenbach, Fl. Exc. 437. (1832).
ACUAN Med. Theod. Sp. 62. (1786).
Desmanthus Willd. Sp. Pl. 4: 1044. (1806).

606. **Acuan illinoensis** (Michx.) Kuntze, Rev. Gen. Pl. 158. (1891).

Mimosa illinoensis Michx. Fl. Bor. Am. 2:254. (1803).

Acacia brachyloba Willd. Sp. Pl. 4: 1071. (1806).

Desmanthus brachylobus Benth. in Hook. Journ. Bot. 4: 358. (1842).

Gravelly banks of Devil's Lake.

Family 65. **AMORPHACEAE** Nwd. (from local flora, not published yet.)

Principal character: Corolla with only one petal (the standard)

AMORPHA Linn. Hort. Cliff. 353. (1737), Gen. 229. (1737), 319. (1754).

607. **Amorpha fruticosa** (Linn. Sp. Pl. 713. (1753).

Banks of the Cannonball River, Wade, Morton Co. (W. B. Bell); Kulm (Brenckle).

608. **Amorpha nana** Nutt. Fras. Cat. (1813).

Amorpha microphylla Pursh, Fl. Am. Sept. 466. (1814).

Minot; Morton Co. (W. B. Bell.)

609. **Amorpha canescens** Pursh, Fl. Am. Sept. 467. (1814).

Butte, Brinsmade, Pingree, Berwick.

Family 66. **PAPILIONACEAE** Valerius Cordus¹ Hist. Pl. oCr. 187. (1561).

Also *Fabaceae* Cordus l. c.

Papilionaceae Linn. Phil. Bot. 33. (1751), also Tour. (*Papilionacei*), I. R. H. 643. (1700).

Leguminosae Boerhave, P. Hermann, Morison, etc.

PETALOSTEMUM Michx. Fl. Bor. Am. 2: 48. (1803).

Kuhnistera Lam. Encycl. 3: 370. (1789). Built on *Kuhnia*, the name is undesirable. Anyway *Kuhnistera* is thought separate from *Petalostemum* (*K. pinnata*).

610. **Petalostemum candidum** (Willd.) Michx., Fl. Bor. Am. 2: 49. (1803).

Dalea candida Willd. Sp. Pl. 3: 1337. (1803).

Leeds, Butte.

¹ *Cytisus Laburnum* "flores producit figura Fabaceos, seu Papilionaceos, quales in omnibus Leguminibus est videre."—Cord. l. c.

Although the name *Fabaceae* as by singular accident is also the one accepted nowadays by American authors, and is first mentioned by Cordus, the second name has been generally accepted. We would scarcely let positional priority go so far as to reject the latter after having been accepted by most botanists for over three centuries.—Nwd. & Lll..

611. *Petalostemum oligophyllum* (Torr. Rydb. Mem. N. Y. Bot. Gard. I: 237. (1900).

Petalostemum gracile var. *oligophyllum* Torr. in Emory, Mil. Recon. 139. (1848).

Leeds, Dunsieith, Bismarck.

612. *Petalostemum purpureum* (Vent.) Rydb. Mem. N. Y. Bot. Gard. I: 238. (1900).

Dalea purpurea Vent. Pl. Jard. Cels. pl. 40. (1800).

Petalostemum violaceum Michx. Fl. Bor. Am. 2:50. (1803).

Leeds, Pleasant Lake, Towner: Kulm (Brenckle).

613. *Petalostemum villosum* Nutt. Gen. 2: 85 (1818).

Pleasant Lake; Denbigh (Bergman).

VULNERARIA Tour. Elémens 311. (1694), Gesner, Hist. Gen. 287. (1560).

Anthyllis Dodonaeus, Gall. (1557), not *Anthyllis* of the ancients which is *Cressa Cretica*; Linn. Gen. Pl. 320. (1754).

614. *Vulneraria rustica* Gesner, Hist. Gen. 287. (1560), also Tour. l. c.; J. Bauhin, Hist. 2. (1623).

Vulneraria heterophylla (Tragus) Moench, teste Bubani, Fl. Pyr. 2: 468, (1900): "Nomen hoc in Tragi operibus non inveni."

Anthyllis Vulneraria Linn. Sp. Pl. 719. (1753).

Adventive from Europe. Fargo. (Cl. Waldron).

LUPINUS Plinius 18:41. "A *lupus* weil er wie ein Wolf die Erde verzehrt, i. e. auszerht."—Fraas, Fl. Classica 51. *Lupinus* Linn. Gen. Pl. 322. (1754).

615. *Lupinus argenteus* Pursh, Fl. Am. Sept. 468. (1814).

Morton Co. (W. B. Bell).

616. *Lupinus pusillus* Pursh, l. c.

Morton Co. (W. B. Bell); Dickinson (Cl. Waldron).

DALEA Linn. Gen. 349. (1737), also Gen. 366. (1742) and Hort. Cliff. 363. (1737) with plate XXV of the type, which is *Psoralea Dalea* or *Dalea alopecuroides* Willd. Sp. Pl. 3: 1336. (1803). The type of genus is not *Dalea obovatifolia* Ort, as Britton says in Britt. & Br. Ill. Fl. II: 336. (1913). *Dalea* as a Linnaean genus had this plant as only specimen known, hence must be the type of Linnaeus.

Dalea not P. Br. (1756). *Parosela* Cav. Desc. 185. (1802).

617. *Dalea alopecuroides* l. c.

Psoralea Dalea Linn. Sp. Pl. 764. (1753).

Parosela Dalea Britt. Mem. Torr. Bot. Club 5: 196. (1894).

Kulm (Brenckle).

618. *Dalea enneandra* Nutt. Fraser's Cat. (1813).

Dalea laxiflora Pursh, Fl. Am. Sept. 741. (1814).

Parosela enneandra (Nutt.) Britton, l. c.

Mandan (Bergman).

THERMOPSIS R. Br. in Ait. Hort. Kew. Ed. 2, 3: 3. (1811).

619. *Thermopsis rhombifolia* (Nutt.) Richards. Frank. Journ. App. 13. (1813).

Cytisus rhombifolius Nutt. Frasers Cat. (1813).

Thermia rhombifolia Nutt. Gen. I: 282. (1818). The name *Thermia* is built on *Thermopsis*.

Williston (W. B. Bell).

PISUM Plinius 18: 7, 12. Virg. Aen. 1: 74. Colum. 2: 10. 44.

Pison Theophr. Hist. 8: 315, Caus. 3: 27. Tour., I. R. H. 394. (1700). Linn. Gen. 324. (1754).

620. *Pisum arvense* C. Bauhin, Pinax, 342. (1623).

Dickinson (Cl. Waldron).

621. *Pisum sativum* Linn.

Escaped from cultivation. Leeds.

MEDICA Virgilius, Georg. 1: 225, Plinius 18: 16, Varro 1: 42, Pallad. 3: 6, Colum. 2: 11. *Medike* Theophr. De Causis Plantarum, also Diosc. 2: 177. Also Tour. Elém. 327. (1694). Linn. Syst. (1735).

Medicago Moench, Miller, Scopoli, Adanson, Haller, etc.

Medicago Tour. is separate from *Medica* Tour.

622. *Medica sativa* Gesner, edit. Kyber (1553), also Rupr., Dabich, etc.

Medicago sativa Linn. Sp. Pl. 778. (1753).

Leeds, Pleasant Lake.

623. *Medica lupulina* Moench. Meth. 116. (1794).

Medicago lupulina Linn. Sp. Pl. 779. (1753).

Fargo (Cl. Waldron).

[*Medicago* is recognized by some authors with some species, as Moench. *Med. arborea*].

SERTULA Linn. Syst. (1735). Not related to *Serratula*.

Melilotus Dios. 3: 41 (Μελίλωτος ἐν Καμπάνια). Plinius 21: 2. ("Melilotus in Campania"; Plinius took many of his botanical things from Diosc. who was the original author). See Cato R. R. 107, Ovidius Meth 4: 440, Veget. de Re. r. 3: 6. *Mellilotus* Galenus, Rivinus, Juss. Gen. Pl. 356. (1789). Name rejected as built on *Lctus*.

624. **Sertula alba** (Desv.) Lunell.

Melilotus alba Desv. in Lam. Encyl. 4: 63. (1797).

Thorne (it grows in waste places as thickly as if it had been seeded); Leeds.

625. **Sertula maior** (Brunfels) Lunell.

Melilotus maior (author) Brunfels, Herb. Viv. Ic. 2: 64. (1531).

Melilotus germanica. Dod. Gull. 341. (1557).

Melilotus vera Gesner, Hist. Gen. (1561).

Melilotus vulgaris Caes. Lugd., not Willd. Enum. Hort. Berol.

790. (1809) = *Sertula alba*.

Trifolium Melilotus officinalis Linn. Sp. Pl. 765. (1753).

Leeds, York, Bismarck.

626. **Sertula Melilotus indica** (Linn.) Lunell.

Trifolium Melilotus indica Linn. Sp. Pl. 765. (1753).

Found as a waif, probably introduced from the west. Leeds.

TRIFOLIUM Plinius, and all writers subsequently. Tour.

Elém. 32. (1694). Linn. Gen. Pl. 337. (1754).

627. **Trifolium procumbens** Linn. Sp. Pl. 772. (1753).

Wahpeton (Bergman).

628. **Trifolium incarnatum** Linn. Sp. Pl. 769. (1753).

Kulm (Brenckle).

629. **Trifolium pratense** Tragus, Stirp. Hist. 586. (1552).

Linn. Sp. Pl. 768. (1753).

Along the railroads, Leeds.

630. **Trifolium hybridum** Linn. Sp. Pl. 767. (1753).

Leeds; Kulm (Brenckle).

631. **Trifolium repens** Rivinus, Tetr. 17. (1691), Linn., Sp. Pl. 767. (1753).

Trifolium acutum Lanner?

Leeds; Kulm (Brenckle).

ACMISPON Raf. All. Jr. 144. (1832).

632. **Acmispon americanum** (Nutt.) Rydb. Bull. Torr. Bot. Club 640: 45. (1913).

Trigonella americana Nutt. Gen. Pl. 2: 120. (1818).

Lotus americanus (Nutt.) Bisch, Litt. Ber. Linnæa 14: 132. (1840).

Hosackia Purshiana Benth. Bot. Reg. Pl. 1257. (1829).

Leeds, Pleasant Lake, Willow City; Kulm (Brenckle).

PSORALEA Royen, Hist. Leyd. 372. (1740). *Psoralea* Linn. Gen. 358. (1742). *Dalea* Linn. Gen. 349. (1737). Spelled *Psoralea* in

in Sp. Pl. 762. (1753). *Dalea* was suppressed by him in Sp. Pl. (1753), its type reduced to *Psoralea* as *Psoralea Dalea*, l. c.

633. *Psoralea lanceolata* Pursh, Fl. Am. Sept. 475. (1814).

On the banks of the Missouri at Bismarck; Williston (W. B. Bell).

634. *Psoralea argophylla* Pursh, l. c.

Leeds, Butte.

635. *Psoralea esculenta* Pursh, l. c.

Leeds, Butte, Minnewaukan; Kulm (Brenckle).

GEOPRUMNON Rydb. Fl. of Colorado 195. (1906).

636. *Geoprumnon succulentum* (Rich.) Rydb. l. c. 203.

Astragalus succulentus Richardson.

Astragalus prunifer Rydb.

Medora (Bergman).

637. *Geoprumnon crassicaupum* (Nutt.) Rydb. l. c. 203.

Astragalus crassicaupus Nutt. Fraser's Cat. No. 6. (1813).

Astragalus carnosus Pursh, Fl. Am. Sept. 740. (1814), in part.

Astragalus caryocarpus Ker. Bot. Reg. pl. 176. (1816).

Leeds, Butte.

638. *Geoprumnon Plattense* (Nutt.) Rydb.

Astragalus Plattensis Nutt.; T. & G. Fl. N. A. I: 332. (1838).

Morton Co.: W. B. Bell.

ASTRAGALUS Dioscorides 4: 120, acc. to Fraas in Daubeney, Roman Husbandry 306. (1857). = *Astragalus christianus* Linn.

Tragacantha Tour. Elémens 330. (1694).

639. *Astragalus canadensis* Linn. Sp. Pl. 757. (1753).

Astragalus carolinianus Linn. Sp. Pl. 757. (1753).

Leeds, Butte, Turtle Mountains.

640. *Astragalus nitidus* Dougl.; Hook. Fl. Bor. Am. I: 149. (1834).

Astragalus adsurgens Hook. and Am. Authors; not Pall. (1800).

Butte, Sheyenne.

641. *Astragalus goniatus* Nutt.; T & G. Fl. N. A. I: 330. (1838).

Astragalus hypoglottis polyspermus T & G.

Astragalus hypoglottis Richardson; not Linn. (1771).

Leeds, Peninsula of Lake Ibsen, Towner, Rolette, Turtle Mountains; Kulm (Brenckle).

XYLOPHACOS Rydberg. Flora of Colorado 195. (1906).

642. *Xylophacos missouriensis* (Nutt.) Rydb. l. c. 206.

Astragalus missouriensis Nutt. Gen. 2: 99. (1818)

Minnewaukan, Pleasant Lake, Minot.

CTENOPHYLLUM Rydberg. Fl. of Colorado. 196. (1906).

643. *Ctenophyllum pectinatum* (Hook.) Rydb., l. c. 207.

Phaca pectinata Hook. Fl. Bor. Am. I: 141, pl. 54. (1830).

Astragalus pectinatus Dougl.; Hook. l. c. 142. (1830).

Minot; Williams Co. (W. B. Bell).

DIHOLCOS Rydb. Fl. of Colorado 196. (1906).

644. *Diholcos bisulcatus* (Hooker.) Rydb., l. c. 207.

Phaca bisulcata Hook. Fl. Bor. Am. I: 145. (1833).

Astragalus bisulcatus (Hook.) A. Gray, Pac. R. R. Rep. 12: part 2: 42, pl. 1. (1860).

Leeds, Oberon, Brinsmade; Kulm (Brenckle).

HOMALOBUS Nutt.; T & G. Fl. N. Am. I: 352. (1838).

645. *Homalobus tenellus* (Pursh) Britt. III. Fl. Vol. II: 305. (1897).

Astragalus tenellus Pursh, Fl. Am. Sept. 473. (1814).

Astragalus multiflorus A. Gray, Proc. Am. Acad. 6: 226. (1864).

Butte, Devils Lake.

646. *Homalobus flexuosus* (Dougl.) Rydb. Fl. of Colorado, l. c. 210.

Astragalus flexuosus Dougl.: Hook. Fl. Bor. Am. I: 141 (1833).

Phaca flexuosa Hook. Fl. Bor. Am. I: 141. (1833).

Leeds, York, Butte; Morton Co. (W. B. Bell's no. 158).

CYSTOPORA (κύστις bladder, ὀπώρα, fruit) Lunell, nom. nov.

Phaca Diosc. = *Cicer Lens* Linn. *Aphaca* (Ἀφάκη) = *Lathyrus Aphaca* Linn.

Phaca Royen, Fl. Lugd. 390. (1740). Linn. Gen. 370. (1742), Gen. 334. (1754).

Bubani uses *Astragalina* to replace *Astragalus*—*Astragaloides* Tour., I. R. H. 399 & 223. (1700), as also Boerhave. Both of these names not acceptable as built on *Astragalus*.

647. *Cystopora lotiflora* (Hook.) Lunell.

Astragalus lotiflorus Hook. Fl. Bor. Am. I: 152. (1833).

Phaca lotiflora (Hook.) T & G. Fl. N. Am. I: 349. (1838).

Pleasant Lake.

648. *Cystopora elatiocarpa*. (Sheldon) Lunell.

Astragalus elatio carpus Sheldon, Minn. Bot. Stud. 9: 20. (1894)

Phaca elatiocarpa (Sheldon) Rydb. Fl. of Colorado, l. c. 211.

- Asragalus lotiflorus brachypus*. A. Gray, Proc. Am. Acad. 6: 209 (1866), not *A. brachypus* Schrank. (1841).
Minot.
- OROPHACA* Britton, Ill. Flora Vol. II: 306. (1897).
649. *Orophaca caespitosa* (Nutt.) Britton, l. c.
Phaca caespitosa Nutt. Gen. 2: 98. (1818).
Leeds, Butte, Knox.
- CARAGANA* Lam. Encycl. I: 615. (1783).
650. *Caragana arborescens* Lam., l. c.
Native of Siberia. Pierce Co.: Barton. A shrub splendidly adapting itself for hedges.
- ARAGALLUS* Necker, Elém. 3: 12. (1790).
Spiesia Necker, Elém. 3: 13. (1790).
Oxytropis D. C. Astrag. 19. (1802).
651. *Aragallus gracilis* A. Nels. Erythea 7: 60. (1899).
Minot.
652. *Aragallus dispar* A. Nels. Erythea 7: 61. (1899).
Butte.
653. *Aragallus monticola* (A. Gray) Greene, Pittonia 3: 212. (1897).
Butte.
654. *Aragallus patens* Rydb. Bull. Torr. Bot. Club 34: 421 (1907).
Kulm (Brenckle).
655. *Aragallus Lamberti* (Pursh) Greene, Pittonia, l. c.
Oxytropis Lamberti Pursh, Fl. Am. Sept. 740. (1814).
Spiesia Lamberti (Pursh) Kuntze, Rev. Gen. Pl. 207. (1891)
McHenry Co.: Sand Hills, Towner, Leeds.
656. *Aragallus Lamberti sericeus* (Nutt.) A. Nels. l. c. 62.
Aragallus sericeus (Nutt.) Greene.
Pleasant Lake.
657. *Aragallus Aven-Nelsonii* Lunell, in Bull. Leeds Herb. No. 2, p. 6. (1908).
Butte, Minot.
658. *Aragallus Richardsonii* (Hook.) Greene, Pittonia 4: 69. (1899).
Oxytropis splendens Richardsonii Hook., Fl. Bor. Am. I: 148 (1833).
- Oxytropis Richardsonii* (Hook.) Woot. & Standley. Contr U. S. Nat. Herb. Vol. XIX: 370. (1915).

Leeds, Dunsieith. The loco weeds appear to have a bad reputation, but—in our state at least—they seem to be rather innocuous.

GLYCYRRHIZA Dioscorides 3: 7. Plinius 22: 9, 21: 25, 11: 54. *Dulcis Radix* Celsius 5: 23. *Γλυκεῖα καὶ σκνδικηρίζα* Theophrastus Hist. 9:13. *Glycyrrhiza* Tour. Elémens 309. (1694). Linn. Gen. 230. (1754).

659. *Glycyrrhiza lepidota* Pursh, Fl. Am. Sept. 480. (1814). Leeds, Butte.

MEIBOMIA Adans. Fam. Pl. 2: 509. (1763). Heister. *Desmodium* Desv. Journ. Bot. (II.) 1: 122. (1813).

660. *Meibomia canadensis* (Linn.) Kuntze, Rev. Gen. Pl 195. (1891).

Hedysarum canadense Linn. Sp. Pl. 748. (1753).

Desmodium canadense DC. Prodr. 2: 328. (1825).

Maple Creek near Monango (Brenckle): Richland Co. (W. B. Bell).

VICIA Varro, De Re Rustica I: 31. Plinius 18: 15. Colum. 2: 14. Ovidius, Faet. 267. Tour. Els. 316. (1694).

661. *Vicia americana* Muhl.; Willd. Sp. Pl. 3: 1096. (1803)

Leeds, Pleasant Lake, Turtle Mountains, Towner, Minot; Bismarck (Brenckle).

662. *Vicia dissitifolia* (Nutt.) Rydb. Bull. Torr. Bot. Club. 33: 144. (1906).

Lathyrus dissitifolius Nutt.; T. & G. Fl. N. Am. I: 276. (1838).

Minot.

663. *Vicia sparsifolia* Nutt. T. & G. Fl. N. Am. I: 270. (1838)

Lathyrus linearis Nutt.; T. & G. Fl. N. Am. I: 276. (1838).

Vicia linearis (Nutt.) Greene, Fl. Francis. 3. (1891).

Leeds, Willow City.

664. *Vicia sativa* Linn. Tan Suecus 254. (1749). Sp. Pl. 736 (1753).

Peninsula of Lake Ibsen; Dickinson (Cl. Waldron).

665. *Vicia villosa* Roth, Tent. Fl. Germ. II, II, 182. (1793.)

Fargo (Cl. Waldron).

LATHYRUS Theophrastus Hist. 8. Columella 2, 10, 19, 9, 7. Tour. Elém. 315. (1694). Linn. Gen. 326. (1754). *Cicerula* Plinius 18: 12.

666. **Lathyrus venosus** Muhl.; Willd' Sp. Pl. 3: 1092. (1803).

Devils Lake, Turtle Mountains. Fourteen years I found this plant occupying a plot of about an acre surface capacity on the Devils Lake ground. It was supported by some invisible shrubbery raising it several feet above the level, with the apparent exclusion of all other plant life. It looked like a hill composed of flowers in myriads. In all my life I have seen nothing as beautiful. Chatauqua colonization, incessant smoke from gasoline engines and domestic animal visitation wiped out all this splendor, not as fast as fire would, but more thoroughly. Nature is exclusive, the more so to those not appreciating her loveliness, and she withdraws her most exquisite grandeur in the presence of unfriendly man.

667. **Lathyrus paluster** Linn. Sp. Pl. 733. (1753.) (Cor.)
Pleasant Lake, Rolla.

668. **Lathyrus ochroleucus** Hook., Fl. Bor. Am. I: 159.
(1833).

Lathyrus glaucifolius Beck. Bot. 90. (1833).

Devils Lake, Pleasant Lake, Turtle Mountains, Minot.

669. **Lathyrus** sp.

In a plot of Siberian wheat. Dickinson (Cl. Waldron).

AMPHICARPAEA Ell. Journ. Acad. Phil. I: 372. (1817).

Falcata Gmel. in L. Syst. Nat. Ed. 13, 2: 1131. (1796). Being just an adjective, with no *distinctive* meaning, like *round*, *green*, etc., this name is objectionable.

670. **Amphicarpaea comosa** (Linn.) Nwd. & Lll.

Glycine comosa Linn. Sp. Pl. 754. (1753).

Glycine monoica Linn.) Ell. l. c. 373.

Falcata comosa (Linn.) Kuntze. Rev. Gen. Pl. 182. (1891).

Devils Lake; Washburn (O. A. Stevens).

PHASEOLUS Diosc. 2: 130. Virg. Georg. I: 222. Plinius 18: 7. Colum, 10: 37, 7: 2, 10: 11, 2.

671. **Phaseolus nanus**, called by Columella Fasellus.

Occasional escape. Leeds.

STROPHOSTYLES Ell. Bot. S. C. & Ga. 2: 229. (1822).

672. **Strophostyles pauciflora** (Benth.) S. Wats. in A. Gray, Man. Ed. VI: 145 (1890).

Phaseolus pauciflorus Benth. Comm. Leg. Gen. 76. (1837).

Morton Co. (W. B. Bell.)

THE NAIADES OF MISSOURI.—VII.

BY WILLIAM I. UTTERBACK.

Eurynia (Micromya) lienosa (Conrad.)

("Little Spectacle Case.")

*Pl. XXVII, Figs. 96 A—D.*1834—*Unio lienosus* Conrad, An. Jl. Sci., XXV, p. 339, pl. 1, fig. 4.1900b—*Lampsilis lienosus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 547.1912b—*Eurynia (Micromya) lienosa* (Conrad) Ortmann, An. Car. Mus., VIII, pp. 340 and 341.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with two-ranks of papillae; anal crenulated; supra-anal high, small, closely connected by mantle edges to anal; inner laminae of inner gills more or less free from the visceral mass; palpi subfalcate connected antero-dorsad about one-half of their length; color of soft parts soiled white except mantle edge of siphonal area blackish, gills brownish.

REPRODUCTIVE STRUCTURES:—Marsupium kidney-shaped, restricted to posterior half of outer gill, consisting of twenty-five distinct ovisacs, which, when gravid, distend transversely in middle and ventrad as white beadlike bodies; inner mantle edge of females antero-ventrad to branchial opening with eight to ten conical tentacles rather wide apart and reaching a little over half way centrad-ventrad; conglutinates large, club-shaped; glochidia large, subovate, measuring 0.220 x 0.270 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, elliptical, moderately inflated, thick; post-umbonal ridge rounded; disk smooth; umbones low sculptured with inverted V-shapes; epidermis reddish brown with dark banded rays; female shell expanded post-ventrad, male rather biangulated behind.

INTERNAL STRUCTURES:—Cardinals double in left, single in right valve; laterals also double in left, single in right; interdentum lacking; beak cavities moderately deep; nacre purplish with old gold and copper-color in branchial cavity.

Sex	Length	Height	Diameter	Locality
♀	53 x	30 x	21.5mm	(Black R., Williamsville)
♂	50 x	30 x	20.0mm	(" " ")
♂	42 x	26 x	17.0mm	(" " ")
♀	29 x	18 x	11.0mm	(" " ")

MISCELLANEOUS REMARKS:—In the young shell of the last measurement the beaks were sculptured with inverted V-shaped ridges similar to that of *subrostrata*. This species is only found in the Black River for this State. Rev. Wheeler considers *licnosa* as intergrading with *nigerrima* and while the two are usually found in the same locality yet *nigerrima* is more likely to occur as a creek form. The writer obtained some gravid August 29 with late embryos. The young one of the above measurement was gravid and, as preserved, shows many characters like that of *subrostrata* but can be separated on account of an insufficient development of mantle edge antero-ventrad to branchial opening.

Eurynia (Micromya) iris (Lea.)

("Rainbow Shell.")

Pl. XXVII, Figs. 97 A and B.

1830—*Unio iris* Lea, Tr. Am. Phil. Soc., III, p. 439, pl. IX, fig. 18.

1898—*Lampsilis iris* Baker, Moll. Chicago, Pt. I., p. 105, pl. XIII, fig. 1; pl. XIV, fig. 2.

1912b—*Eurynia (Micromya) iris* (Lea) Ortmann, An. Car. Mus., VIII, p. p. 341 and 342.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely papillose; anal crenulated; supra-anal large, closely connected to visceral mass; palpi small, one-half connected antero-dorsad; color of soft parts dark tan with posterior part of gills and mantle blackish.

REPRODUCTIVE STRUCTURES:—Marsupia composed of twenty closely crowded ovisacs occupying post-half of outer gills; inner mantle edge fringed with eight or ten papillae, the most anterior ones reaching well toward the center of ventral edge where they are larger, postero-curved and terminating in small low papillae near the branchial opening—all rather wide apart; glochidia rather large, subovate measuring 0.240 x 0.300 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, elongate-elliptic, thin, dorsal line slightly curved, ventral straight; compressed anteriorly inflated in center of post-umbonal ridge; beaks pointed but low, sculptured by seven or eight double-looped ridges; epidermis

smooth reddish-brown with bright green rays arranged all over its shell.

INTERNAL STRUCTURES:—Cardinals double in both valves, laterals double in left, single in right; beak cavities rather shallow; nacre white or light bluish.

Sex	Length	Height	Diameter	Locality
♂	45	x 22	x 15mm	(Jack's Fork of Current R.)
♀	35	x 18	x 10mm	(White R., Hollister)
♀	34	x 16	x 11mm	(Black R., Williamsville)
♂	22	x 12	x 7mm	(Jack's Fork of Current R.)

The last measurement is that of a young shell that shows a beak sculpture of a profusely double-looped or corrugated ridges the latest one being the strongest and running down quite low on the disk.

MISCELLANEOUS REMARKS:—For this State *iris* is strictly a southern shell, being only found in the White and Black River basins. Perhaps this pretty little shell is much more common than supposed, since it is so liable to escape observation due to its minuteness of size yet its bright green rays of uneroded shells make it rather conspicuous in clear shallow water. It has been found to be bradytictic.

Eurynia (Micromya) brevicula (Call).

("Broken Rays," "Soul-of-Wit.")

Pl. XXVII; Figs. 98 A—D.

1887—*Unio breviculus* Call, Pr. U. S. Nat. Mus., X, p. 499, pl. XXVIII;

Tr. Ac. Sci. St. Louis, VII, (1895) p. 6, pl. XVI.

1900b—*Lampsilis breviculus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 533.

ANIMAL CHARACTERS.

NUTRITIVE CHARACTERS:—Branchial opening densely papillose; anal crenulated; supra-anal large, high, well separated from anal with thick, spotted mantle edges; inner laminae of inner gills not free from visceral mass; palpi rather large, connected by their edges one fourth of their length antero-dorsad.

REPRODUCTIVE STRUCTURES:—Marsupium rather kidney-shaped consisting of ten or fifteen ovisacs well separated, with bluish ventral border and each ovisac presenting a beaded appearance of black pigmented spots; in female mantle border antero-ventrad to branchial opening with a flap-like structure bearing eight

or ten papillae terminating toward the center of ventral border with longer finger-like tentacles; glochidium unknown, but is identical doubtless with that of its sub-species, *Brittsi*.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elliptical, medium in size, usually rather thin, evenly rounded before; post-umbonal ridge not present; beaks large but low sculptured by six inverted V-shaped ridges with their apices pointing toward the tips of the beaks and with the posterior ridges extending out as longer and more oblique rows at the base of the post-ridge region; epidermis smooth, shiny, straw-color with coarse broken rays most pronounced posteriorly.

INTERNAL STRUCTURES:—Cardinals erect, double in left, single in right valve; interdentum narrow; laterals double in left, single in right, blade-like; beak cavities rather deep and base-like; nacre bluish or whitish with tinge of pink in umbonal cavities.

Sex	Length	Height	Diameter	Locality
♂	64	x 40	x 27 mm—	(White R., Hollister)
♀	55	x 47	x 22.5mm—	(" " ")
♀	51	x 40	x 23 mm—	(" " ")
♂	40	x 25	x 18 mm—	(" " ")

MISCELLANEOUS REMARKS:—This species is strictly a S. Mo. shell and its sub-species is only found in Central Missouri. Some of the South Missouri streams bear *brevicula* that almost approach *Brittsi*; however, *brevicula* is a rather common shell in the streams of the south slope of the Ozarks, where it is typical. Young shells of this species are very thin, while the adult shells become very thick comparatively. Perhaps this species exhibits sexual dimorphism more than any of this genus. The female had a much broader, shorter more inflated shell than the male; the latter being more or less biangulated behind. The slightly long incurved post-ventral portion of the female shell is very characteristic. Gravid females are unknown. *Brevicula* is the largest, most emphatic member of the *Micromya* group.

Eurynia (Micromya) brevicula Brittsi (Simpson).

("Britts' Shell.")

Pl. XXVII; Figs. 99 A and B.

1900a—*Lampsilis brittsi* Simpson, Pr. Ac. Nat. Sci. Phila., p. 76, pl. V., fig. 1 and 2; 1900 b, U. S. Nat. Mus. Pr., XXII, p. 533.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with large yellowish papillae; anal crenulated; supra-anal moderately separated from anal by distinct mantle connection; gills wide, the inner slightly longer and wider, the inner laminae connected with the visceral mass their entire length; palpi wide and large, united one fourth of their length antero-dorsad; color of soft parts tan-color except foot which is more yellowish and mantle edge which is black for the siphonal openings.

REPRODUCTIVE STRUCTURES:—Marsupia wide, more or less reniform, consisting of about a dozen large distinct ovisacs, distended, when gravid, transversely in center and along the ventral edge into black pigmented beads at the distal ends; conglutinates white, rather club-shaped; *glochidia moderately large, semi-elliptical, hinge line slightly oblique and undulate measuring 0.250x0.305 mm.*; mantle edge antero-ventrad to branchial opening with a flap extending toward the center of ventral margin with about ten papillae beginning rather low at edge of branchial opening and ending with tentacular processes at end.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell medium in size, thick to thin, subelliptical; post-umbonal ridge lacking; beaks large but low-sculptured by six inverted V-shaped ridges the posterior ones being longer and thrown more or less obliquely across post-umbonal slope; disk without sculpture; male shell rounded before, rounded and more or less biangulated behind; female shell very deeply and widely sulcated at the post-ventral margin of shell and is less elliptic in general outline, also thicker and more inflated than male shell; epidermis yellow to olivaceous with broad, widely separated rays of interrupted lunate or V-shaped splotches—all covering the whole shell.

INTERNAL STRUCTURES:—Cardinals stout, double in left, single in right valve; interdentum long, narrow; laterals short somewhat curved reaching far back; beak and branchial cavities rather deep and basin-like; scars well impressed; nacre white, pinkish and iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♀	64	x 40	x 27mm—	(Niangua R., Hahatonka)
♀	55	x 36	x 25mm—	(" " ")
♂	40	x 24	x 14mm—	(" " ")

The peculiarity of the shell of this sub-species (as well as that of the species) is that the younger the shell the very much thinner. It is also more brilliantly tawny and green rayed.

MISCELLANEOUS REMARKS:—Surely this form of *brevicula*, found by the writer in its type locality, Niangua River, has enough peculiar characters to entitle it to a good species, as Simpson had first considered it. Its special characteristic is the very wide, deep emargination in the female shell at its post-ventral margin. However, it is almost identical with its parent species as to its soft parts. Its tentacled lamellar-like flap on the mantle edge antero-ventrad to the branchial opening is somewhat like that of *ventricosa* and hence might be grouped under the *Lamp. luteola* group; however, the smaller papillae along the posterior end of the flap (or rather thickened mantle edge) would class it more as an *Eurynia*. *Brittsi* is to be distinguished from its parent by the *greater post-ventral sulcus* (Fig. 99), which extends in as a rather deep radial furrow for a short distance forming the greatest inflation of the shell in front of this. It also differs in shell characters from the female species (*brevicula*) in not being so broad posteriorly and not as rounded post-dorsad. Dr. Britts collected the originals from Niangua River and sent them to Simpson for naming; hence the consequent name of this species. Cotypes (now in the hands of the writer and illustrated herewith) collected from almost the same point in the Niangua show a decided difference from cotypes of Call's *brevicula* many of which are now in the writer's collection, through the kindness of Mr. B. F. Bush, one of the most active students and collectors of *Naiad* shells now living in this State. This sub-species is bradytictic as inferred from the writer's brief breeding record. He has had the good fortune to *collect the glochidia of this form for the first time*. In all probability this glochidium is the same as that of Call's *brevicula*. However, its breeding season seems to be a little different as the writer collected many of the species only a day or two later to find them all sterile.

Sub-Genus *Eurynia* (Sens. Strict.) Rafinesque.

1912b—*Eurynia* (as sub-genus), Ortmann, An. Car. Mus.; VIII, p. 338.

(Type, *Unio recta* Lamarck.)

ANIMAL CHARACTERS:—Differs from those of *Micromya* in the structure of its rough mantle edge antero-ventrad to branchial opening being more differentiated into a greater number and longer

row of papillae on the inner edge extending down quite to the central part of the ventral edge. These papillae are often quite tentacular and are rather regular and uniform in shape and size and are never widely separated as in case of the *Micromya* mantle edge of this anterior branchial border. Its inner laminae of the inner gills are usually entirely connected with the visceral mass; however, a small hole is sometimes left at the posterior end post-dorsad to foot.

SHELL CHARACTERS:—In shell characters there are no great distinctions to be considered as a group since the chief distinguishing characteristic is in the post-mantle edge as above discussed. Its beak sculpturing is identical with that of the *Micromya* shell being sinuated or double-looped, the posterior loops being more or less broken behind.

This group of *Eurynia* is represented in this State by *E. (E) subrostrata* and *recta*, both having rather wide distribution.

***Eurynia (Eurynia) subrostrata* (Say).**

("Common Pond-Mussel," "Lilliputian.")

Pl. XXVII; Figs. 101 A—D.

1831—*Unio subrostratus* Say, New Harm. Diss.

1850—*Unio mississippiensis* Conrad, Jl. Ac. N. Sci. Phila., 1, p. 277, pl. XXXVIII, fig. 11.

1868—*Unio topekensis* Lea, Pr. Acad. Nat. Sci. Phila., XII, p. 144.

1900b—*Lampsilis subrostratus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 546.

1912b—*Eurynia (Eurynia) subrostrata* (Say), Ortmann, An. Car. Mus., VIII, p. 344.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening narrowly papillose; anal finely papillose supra-anal separated from anal by a rather short mantle connection; inner laminae of inner gills connected to visceral mass; palpi rather small and connected antero-dorsad about one-fourth of its length; color of soft parts grayish with mantle edge along siphonal region blackish.

REPRODUCTIVE STRUCTURES:—Marsupia kidney (or rather) fan-shaped, consisting of twenty large, well defined ovisacs, distended, when gravid, at ventral edge thus giving the conglomerates a club-like shape; ventral tips of ovisacs beaded bearing bluish pigment with glochidia scattered throughout the sacs;

glochidia rather large, semi-elliptical, spineless, regularly rounded ventrad, hinge-line straight, measures 0.270 x 0.330 mm.; mantle edge antero-ventrad to branchial opening in female with numerous regular papillae extending quite down to the central part of ventral border.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small to medium in size, rather elongate-elliptic, thin, compressed; post-umbonal ridge rounded; female shell very wide and blunt posteriorly, male pointed and narrow; umbones low, sculptured by eight or ten coarse, regular, inverted V-shaped ridges with the apices pointed toward tips of beaks, the posterior ridges longer and more disposed obliquely across base of post-ridge; disk without sculpturing; epidermis brown to black with many rays disposed posteriorly and showing through on the nacreous surface.

INTERNAL STRUCTURES:—Cardinals double in both valves, rather thin and erect; laterals thin, double in both valves; scars rather well impressed; beak and branchial cavities rather deep and hollowed out; nacre white to light bluish iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♂	62 x	27 x	21.5mm—	(Flat Creek, Sedalia).
♀	65 x	36 x	25.5mm—	(Hinkston Creek, Columbia)
♂	50 x	28 x	15.5mm—	(Lost Creek, Amity)
♀	36 x	18 x	13.5mm—	(Flat Creek, Sedalia)

This last measurement is for one that has preserved soft parts and although it is very young and small yet it is gravid with normal glochidia. Its beak sculpture is very distinct as shown above in the description of shell character.

MISCELLANEOUS REMARKS:—*Subrostrata* is a creek and pond shell, but in spite of this lacustrine disposition it is never found in any of the North West Missouri lakes. Like *U. tetralasma* it adjusts itself easily and quickly to artificial ponds and channels. It is never found in large rivers nor swift streams. It has a general distribution over the State, especially in the ponds and quiet creeks of Central part. Simpson gives it a general distribution over the entire Mississippi drainage north of about latitude 41°. The breeding season of *subrostrata* is a long one. Its glochidia seem to be very constant in size for widely separated localities. Comparisons have been made of glochidia from mussels of Central Missouri

sculptured by fine concentric ridges disposed somewhat like that of with those from the Mississippi to find them precisely identical in every respect.

Eurynia (Eurynia) recta (Lamarck).¹

("Spectacle-Case," "Black Sand Shell.")

Pl. XXVII; Figs. 100 A—D.

1819—*Unio recta* Lamarck, An. Sans. Vert., VI, p. 74.

1823—*Unio praelongus* Barnes, Am. Jl. Sci., 1st ser., VII, p. 261, fig. 11.

1900b—*Lampsilis rectus* Simpson, Pr. U. S. Nat. Mus., XXII, pp. 544-545.

1912b—*Eurynia (Eurynia) recta* (Lam.) Ortmann, An. Car. Mus., VIII, p. 344.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening with numerous papillae; anal finely crenulate; supra-anal separated from anal by moderate mantle connection; inner laminae of inner gills connected to visceral mass; palpi small, almost entirely free along their antero-posterior edges; color of soft parts grayish with its posterior mantle border blackish or reddish brown.

REPRODUCTIVE STRUCTURES:—Marsupium rather kidney-shaped consisting of fifty large ovisacs extending below the original ventral line into thickened, cream-colored, cone-shaped beads when gravid; ova lying in irregular masses within the sacs; mantle edge antero-ventrad to branchial opening specialized with very great number of large, densely crowded papillae extending entirely to the center of the ventral edge; conglutinates white, glochidia rather medium in size, semi-elliptical, spineless, rounded ventral edge, hinge line undulated, measure 0.220 x 0.280 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Elongate-elliptic, heavy, rather thick, large; female shell broader and more blunt posteriorly than male; no post-umbonal ridge; disk smooth; beaks large, low sculptured by fine concentric ridges disposed somewhat like that of

¹ This Species is the most generally distributed of the *Lampsilinae*. (See accompanying Map (Plate XXIX) for three other generally distributed Species; viz., *Cumberlandia monodonta* (Say) as representative of *Margaritanidae*, *Quadrula verrucosa* (Raf.) of *Unioninae* and *Strophitus edentulus* (Say) of *Anodontinae*.

subrostrata; epidermis black, glossy, rayed with broad reddish stripes.

INTERNAL STRUCTURES:—Cardinals very long and stout, double in both valves; laterals long, somewhat pointed in male, more or less horizontal in female; nacre usually rich purple but is variable to white, or the two colors may be present for the same individual.

Sex	Length	Height	Diameter	Locality
♂	125	x	53	x 31mm—(Black R., Williamsville)
♀	109	x	48	x 30mm—(Osage R., Osceola)
♂	96	x	40	x 25mm—(Gasconade, Gascondy)
♀	78	x	30	x 18mm—(White R., Hollister)

MISCELLANEOUS REMARKS:—No juvenile shells are at hand. Adolescent shells of *recta* are even difficult to obtain. *Recta* is not a variable shell for this state; even in nacre-color it is rather constant—being more purple in Central Missouri and white in South and Southwest Missouri streams. This species has one of the widest distributions in the state; however, it is seldom found in the North Missouri streams. It is strictly fluviatile. According to Simpson it has a very general distribution over the United States, although it is not very common in its individual occurrence anywhere. The predominance of one sex over another in this species for the same stream is more noticed than in any other. Probably this occurrence is due more to breeding season than to any other cause. The writer notes from his own record, and that of others, that this species is bradyctictic.

Surber (1913, p. 109) finds that the occasional host for *recta* to be the sunfish (*L. pallidus*).

Genus *Lampsilis* Rafinesque.

1820—*Lampsilis* Rafinesque, Monog., Ann. Gen. Sci. Phys.

Brux. p. 298; 1900b, Simpson, Pr. U. S. Nat. Mus., XXII, p. 526.

(Type, *Unio ovatus* Say.)

ANIMAL CHARACTERS:—Branchial and anal opening papillose; supra-anal not very large, separated from the anal by a moderate connection; inner laminae of inner gills connected to the visceral mass, sometimes a small hole is left post-dorsad of foot; marsupium usually kidney-shaped, distended, consisting of many ovisacs which are distinct, extended below original edge of sterile marsu-

pium when gravid into blunt, pigmented beads; mantle edge double posteriorly, the inner one antero-ventrad to branchial opening developed into a ribboned flap usually produced into a tentacled lobe at its end located about the lowest post-ventral point; conglutinate not solid; glochidia rather large, subelliptic.

SHELL CHARACTERS:—Shell elliptical to ovate; disk smooth; beaks sculptured by the sinuate or double-looped type, sometimes with a tendency of the posterior loop to become broken; epidermis usually smooth, thin and shiny often brilliantly rayed. Hinge with two cardinals and two laterals in left and two cardinals and one lateral in the right valve; female shell with an inflation at the post-ventral region of shell just over the marsupia.

MISCELLANEOUS REMARKS:—The differentiation of the mantle antero-ventrad to branchial opening into a flap marks this genus as among the highest of the *Lampsilinae*. This flap is so developed with tentacles and papillae that it is often extended externally and waved to and fro so as to produce almost the best possible aëration for the embryos. This genus is represented in this State by five species which have a good general distribution.

Lampsilis anodontoides (Lea).¹

("Yellow Sand Shell," "Lady's Finger.")

Pl. VIII, Figs. 17 A and B; Pl. XXVIII, Figs. 102 A—D.

1834—*Unio anodontoides* Lea, Tr. Am. Phil. Soc., IV, p. 81, pl. VIII, fig. 11.

1834—*Unio teres* Say, Am. Conch., VI; 1820, Rafinesque, Monog.

1898—*Lampsilis anodontoides* Baker, Moll Chicago, Pt. I, p. 100, pl. X, fig. 1.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening rather small directed upward; anal crenulated; supra-anal high well separated by mantle edges from anal; inner laminae of inner gills connected to visceral mass; palpi long, falcate, connected for one-half of their length antero-dorsad; color of soft parts grayish except brownish red mantle border at branchial opening.

¹ From Rafinesque's evident description of this Species in the Supplement to his Monograph of 1820 under *Unio teres* (*Elliptio teres*) Lea's name, as given here by Simpson, (1900b, p. 543,) should stand as a synonym for *Lampsilis teres* (Raf.).

REPRODUCTIVE STRUCTURES:—Marsupium rather reniform occupying over posterior half of outer gills and consisting of sixty-five ovisacs well separated, when gravid extending below original ventral edge of sterile marsupia; inner mantle edge antero-ventrad to branchial opening a specialized flap reaching down to lowest point of the post-ventral part of shell where it is developed into a tentacular lobe; conglutinates white, sole-shaped, not very solid, glochidia medium in size, sub-elliptical, spineless, hinge line rather short, evenly curved, measuring 0.185 x 0.210 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell elongate-elliptic, medium in size, subsolid, disk smooth; umbones large, but not full, sculpture by five or six double looped or sickle-shaped ridges most pronounced and opened at base of post-umbonal slope; epidermis straw-color (usually without much display of rays) smooth, polished; female shell much produced at the post-ventral edge of shell and continued upward as a marsupial inflation for a short distance; male shell pointed posteriorly.

INTERNAL STRUCTURES:—Cardinals prominent, serrate, double in right valve, single in left; beak and branchial cavities rather deep and basin-like; nacre satin-white, iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♂	120	x 60	x 45mm—	(Chariton R., Kern)
♀	100	x 50	x 38mm—	(Miss. R., Hannibal)
	50	x 23	x 16mm—	(Grand R., Darlington)
	12.5	x 6	x 5mm—	(Grand R., Utica)

The last measurement was that of one of the smallest juveniles obtained by the writer. It has a black border to its shell and a short byssus extending from between the valves at ventral portion of shell.

MICELLANEOUS REMARKS:—Even in the juvenile *anodontoides* there is some difference from that of the *fallaciosa* shell in that there are not as evident. The main distinction between the adult shells of these two species is that of *fallaciosa* is brilliantly rayed, is smaller, has more reddish beaks and is a dweller in muddy creeks, sloughs and lakes while *anodontoides* loves sandy situations of swifter water and develops a large, thick shell, rayless, unicolored epidermis and is a most active mussel. When perfect (as it is found in the Chariton and Mississippi Rivers) it is one of

the most beautiful shells. It is strange that it should not be found anywhere in the Ozarks as it seems to be a mussel that rather prefers swift current. Yet as that is an unglaciated region without much sand, to which it is partial, we may account for its absence there in part. It is entirely supplanted in the Osage by *fallaciosa*. From the writer's breeding record for this species it is bradyctic.

***Lampsilis fallaciosa* Smith.**

("Slough Sand Shell," "Creeper.")

Pl. VII, Figs. 18 A and B.

1899—*Lampsilis fallaciosa* Smith, Bull. U. S. Fish., p. 291, pl. LXXIX;
1900a, Simpson, Pr. Ac. N. Sci. Phila., p. 74, pl. II, fig. 5.

ANIMAL CHARACTERS:—Identical with *L. anodontoides* in every respect, except perhaps in glochidial characters.

SHELL CHARACTERS:—Differs from *anodontoides* in possessing a smaller, lighter, thinner shell; a more prominent post-umbonal ridge; more pronounced beak sculpture; pinkish nacre in umbonal cavity; bright yellowish, or olivaceous epidermis with bright green rays all over shell—especially on the posterior slope; rusty red color often for umbonal region; a sulcus often seen just anterior to the post-ventral edge and extending a short distance up on the shell as a radial furrow.

Sex	Length	Height	Diameter	Locality
♂	94	x 45	x 28	mm—(Lower L. Contrary, St. Joseph)
♀	64	x 30	x 21	mm—(Chariton R., Kern)
♀	64	x 31	x 21	mm—(Miss. R., Hannibal)
	51.5	x 24.5	x 15	mm—(Osage R., Warsaw)
	14	x 7.5	x 5.5	mm—(Grand R., Chillicothe)

The last measurement is that of a juvenile identified by Dr. Howard. Its beaks are sculptured by two or three subparallel ridges at the base of the post umbonal slope and a few very faint tubercles at the base of the anterior umbonal slope. Anterior end of the shell is greatly produced as noted in most juvenile shells of any species. Note the very small inflation in the above measurement. It is strange that this shell at this stage of its life should be practically rayless while the rayed character of the adult shell is its chief feature.

MISCELLANEOUS REMARKS:—*Fallaciosa* may have developed from *anodontoides* for ecological reasons. This little striped shell

is a dweller along the edges of muddy streams or in ponded stretches of the rivers and prefers lacustrine situations. For that reason it is commonly known as "Slough Sand Shell," and "Creeper." Mr. Walker makes the assertion that typically these two species are very distinct, but that it is frequently difficult to name individual specimens so given are they to intergrading. The fact, too, that both forms are found in the same stream (as in the Chariton R., for instance) and apparently entirely distinct would go to show that they are specifically distinct. Besides Surber (1912, p. 5) states a difference in size of glochidia, those of *fallaciosa* being larger (0.200 x 0.240 mm.) than those of *anedontoides* (0.185 x 0.210 mm.).

Surber (1913 p. 107) also reports that this species (*fallaciosa*) has for its fish host the crappie (*P. platyrhynchus*) its glochidium being a gill parasite.

Lampsilis Higginsii (Lea).

("Higgin's Shell.")

Pl. XXVIII, Figs. 105 A and B.

1857—*Unio higginsii* Lea, Pr. Ac. N. Sci. Phila., IX, p. 84.

1900b—*Lampsilis higginsii* Simpson, Pr. U. S. Nat. Mus., XXII, p. 540.

ANIMAL CHARACTERS:—As only dead shells of this species have been secured by the writer no description of the soft parts can appear here. Surber (1912 p. 0) reports its glochidium as sub-elliptic, spineless, with hinge line short and measures 0.210 x 0.260 mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell very thick; male sub-elliptic; female subrhomboid with posterior end vertically truncate; beaks very large, rounded, full, sculpture unknown; epidermis brownish-red with rays.

INTERNAL STRUCTURES:—Cardinals large, erect; laterals straight in female; slightly curved in male shell; interdentum wide, thick; beak cavities deep; scars deep; nacre rosy pink to salmon.

Sex	Length	Height	Diameter	Locality
♂	86	x 63	x 45mm—	(Mississippi R., Hannibal)
♀	68	x 50	x 38mm—	(" " ")
♂	85	x 48	x 48mm—	(" " Louisiana)

MISCELLANEOUS REMARKS:—According to Simpson this is a puzzling species that closely resembles *O. ellipsis* in outline and its great posterior truncation and post-ventral inflation of the female shell would seem to be characteristic enough to make it a good species. Male shells obtained from the Mississippi River of this State, in the hands of the writer, look more like *N. ligamentina* than anything else, yet its cardinals are more stumpy, is a thicker heavier shell and has a rosy nacre. This State is within its range, as its distribution is from Iowa to Kansas. Surber reports "Sauger" (*S. canadense*) as its fish host.

Lampsilis Powellii (Lea).

("Powell's Shell.")

Not figured.

1852—*Unio powellii* Lea, Pr. Am. Phil. Soc., V., p. 252; Tr. Am. Phil. Soc., X, p. 270, pl. XIX, fig. 25.

This species is listed for Missouri through a report by Mr. Frierson from a collection made by F. A. Sampson for the Elk River, McDonald Co., this State. Since no specimens are at hand the writer can give no description except that for the shell quoted from Scammon (1906, pp. 288 and 289).

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—"Shell large, rather thin, elliptical in outline, neither inflated nor compressed. Anterior margin almost circularly rounded; ventral margin gently and evenly bowed; posterior margin rounded, biangulated; dorsal margin rather long and straight. Umboidal ratio in specimens examined, 0.20., umbones rather flattened. Anterior and lateral slopes flattened and rounded; posterior slope very slightly excavated and marked with two radial lines. Epidermis smooth and generally shining, olive-brown. Ligament long and rather thick.

INTERNAL STRUCTURES:—"Pseudo cardinals small, serrate, rather bluntly pointed, single in right valve and double in left. Laterals long, slightly curved, lamellar. Interdentum long, narrow, rounded. Anterior adductor cicatrix well impressed, large, much longer than wide; posterior scars large, very slightly impressed, confluent. Dorsal cicatrices on the lower surface of the interdentum. Pallial line well impressed in its one-half and crenulate. Cavity

of beaks deep, of the shell moderately deep. Nacre white, decidedly iridescent posteriorly."

Dr. Scammon reports *Powellii* as a very rare shell for Kansas, being found in only one locality, Spring River, Baxter Springs, and further states that this species may be distinguished from *L. luteola*, its nearest ally in local waters, by the smaller and less pointed cardinals and the thinner, squarer and less inflated shell. Simpson states that *Powellii* is also found in Salina and Clinton, Arkansas, and in Guadalupe River, Texas. The fact that Mr. Simpson found this rare shell in the Neosho basin of this State its range is more determined.

***Lampsilis luteola* (Lamarck).**

("Fat Mucket.")

Pl. XXVIII, Figs. 103 A—F.

1819—*Unio luteola* Lamarck, His. Sans. Vert., VI, p. 79.

1898—*Lampsilis luteola* Baker, Mol. Chicago, Pt. I, p. 103, pl. XI, fig. 12; pl. XXXVII, fig. 12.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening large with numerous papillae; anal slightly crenulated; supra-anal well separated by thick mantle connection; inner laminae of inner gills connected to visceral mass; palpi short, wide; color of soft parts dirty white, mantle border blackened posteriorly.

REPRODUCTIVE STRUCTURES:—Mantle edge antero-ventrad to branchial opening with long spotted flap at the end of which are two or three finger like tentacles and about midway an eye spot appears; marsupium large, kidney-shape, consisting of numerous distinct ovisacs that hang down toward the mantle flap in beaded rows; conglutinates white, large, subsolid; glochidium rather large (uniformly smaller for lacustrine *luteola*), subelliptic, spineless, measuring 0.250 x 0.290mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell broadly elliptic, narrowly rounded before, broadly rounded behind; female shell greatly inflated, rather truncated posteriorly expanded post-ventrad, male shell pointed posteriorly; disk smooth; umbones large but low,

sculpture faint consisting of fine broad, inverted V-shaped lines with the apices pointing toward tips of beaks; epidermis yellowish or olivaceous with widely separated and interrupted rays.

INTERNAL STRUCTURES:—Cardinals double in left, single in right; laterals doubled the same; nacre white.

Sex	Length	Height	Diameter	Locality
♀	110	x 65	x 48mm—	(Flat Creek, Sedalia)
♂	130	x 68	x 48mm—	(" " ")
♀	82	x 46	x 30mm—	(Black R., Williamsville)
♂	54	x 30	x 17mm—	(White R., Hollister)

MISCELLANEOUS REMARKS:—Although *L. luteola* is considered as having the greatest geographical distribution over all United States yet (strange to say!) it has limited distribution in Missouri. It is not found at all in North Missouri, occurs very sparingly for Central Missouri, (especially in the Osage basin) and is not at all typical for South Missouri. The best types are found in Crow's Fork, Fulton, and in Flat Creek, Sedalia, where the female shells attain enormous size and thickness—the typical "Fat Mucket," as it is known on the market. Surber finds that the glochidia of *luteola* attain a larger size in the fluviatile forms (1912, p. 4) and thinks that the larger size of the river form may be correlated with the larva. *Luteola* is bradyctic.

***Lampsilis luteola rosacea* (DeKay).**

("Rosy Mucket.")

Pl. XXVIII, Figs. 104 A and B.

1843—*Unio rosaceus* DeKay, Zool. of New York, V., p. 192, pl. XXXIV, figs. 355 and 356.

1900b—*Lampsilis luteolus rosaceus* (DeKay) Simpson, Pr. U. S. Nat. Mus., XXII, p. 535.

ANIMAL CHARACTERS:—No soft parts have been seen but in all probability identical with those of the parent.

SHELL CHARACTERS:—Identical in all respects with the parent species except in its solid pink nacre.

Sex	Length	Height	Diameter	Locality
♂	125	x 72	x 49mm—	(White R., Hollister)
♀	90	x 52	x 37mm—	(Black R., Williamsville)

MISCELLANEOUS REMARKS:—A cotype from a lot of pink-nacred shells collected by the writer in the White and Black

Rivers was pronounced by Mr. Frierson as *rosacea* DeKay but not exactly the author's shell from the St. Lawrence. Mr. Walker comments:—"I do not remember of ever having seen a red-nacred *luteola* from the southwest. The Great Lakes form, *rosacea* DeKay, is typically red or rather pink."

Lampsilis reeviana (Lea).

("Reeve's Shell.")

Not figured nor described.

1852—*Unio reevianus* Lea, Tr. Am. Phil. Soc., X, p. 272, pl. XX, fig. 28.

This species is catalogued through a report of it for Clinton, Missouri. The writer has not found it; hence no figure nor description appears here. Simpson reports this throughout the Southwest and hence the locality of this State, from which Mr. Walker reports as having received his *reeviana* shell, is within the range.

Lampsilis ventricosa (Barnes).¹

("Pocket Book.")

Pl. XXVIII, Figs. 106 A—D.

1823—*Unio ventricosus* Barnes, Am. Jl. Sci., VI, p. 267, pl. XIII, fig. 14. (in outline).

1900b—*Lampsilis ventricosus* Simpson, Pr. U. S. Nat. Mus., XXII, p. 351.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial and anal opening papillose; supra-anal large, closely connected to anal; inner laminae of inner gills connected to visceral mass; palpi connected about two-thirds of their length antero-dorsad, color of soft parts whitish except foot which is pinkish and gills of male and sterile female which are light brown, gravid marsupium darker brown, edged in blue and black.

REPRODUCTIVE STRUCTURES:—Marsupium kidney-shaped con-

¹ According to Vanatta, l. c., (1915, p. 551), *Lampsilis ventricosus* Bar. (1823) of Simpson's Synopsis, p. 526, should read *Lampsilis cardium* Raf. since this Species is unquestionably the *Lampsilis cardium* (*Unio cardium*) of Rafinesque's Monograph (1820), p. 298, No. 14, Pl. 80, Figs. 16, 17, 18 and 19, as now identified from Types in the A. N. S. P. Coll., No. 20, 210.

sisting of thirty large ovisacs distended, when gravid, at their distal ends into bulging beads drawn down near to mantle flap which is a long, wide, ragged ribbon that bears eye spots and extends to bend of the post-ventral curve of the shell; conglutinates white, discharged in unbroken masses; glochidia medium in size, semi-elliptic, with rather straight hinge line, measuring 0.205 x 0.255mm.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell of female sub-rhomboidal greatly inflated, swollen post-ventrad, male sub-elliptic not so inflated; narrowly rounded before, disk smooth, without sculpture; beaks very full, very much inflated, sculptured by four coarse sub-parallel bars with rounded furrows between; epidermis thin, smooth, polished, yellowish, bluish olivaceous or even terracotta, with broad brilliant green, or blue-green rays all over shell; post-umbonal ridge prominent but not angled.

INTERNAL STRUCTURES:—Cardinals prominent, serrate, rather curved; laterals erect blade-like; beak cavities very deep and basin-like; nacre pure marble white, sometimes inclined to pink.

Sex	Length	Height	Diameter	Locality
♀	100 x	65 x	45mm—	(Gasconade R., Gascondy)
♂	90 x	65 x	42mm—	(Black R., Williamsville)
♂	110 x	39 x	26mm—	(Osage R., Osceola)
♀	55 x	39 x	26mm—	(Miss., R., La Grange)

The young shells are very bright colored. The specimen of the last measurement has a blue epidermis with bright blue-green stripes. Its beak sculpture is very plain and eroded in curved beaks showing as above described. No juveniles obtained.

MISCELLANEOUS REMARKS:—Young shells look much like *multiradiata* but can be distinguished from the latter by the presence of post-umbonal ridge and by not possessing so many finer rays. The adult shell is told from that of *ovata* by not possessing the sharp cornered post-ridge, larger shell and more peculiar rays. Aside from these two related shells *ventricosa* is unique. *Multiradiata* and *ovata* are not found in Missouri. *Ventricosa* is also very peculiar in the structure of its soft parts—especially in the great development of the mantle flap that characterizes the genus *Lampsilis*. The writer has observed these flaps extended and in action both in the aquarium and in nature. Three have been seen

spawning, at which time the mother buries her shell in the sand up to the siphonal openings, the flaps are waved to and fro exposing the ventral edges of the ovisacs through the branchial opening while ever now and then sole-shaped conglutinates emerge from the anal opening by convulsive jerks. With the eye spots showing at the base and the fringed flaps rhythmatically waving one is fascinated. *Ventricosa* is found to be typically bradytictic. The geographic distribution for Missouri is wide; however, it is of rare occurrence in the streams of North Missouri—never found in Northwest Missouri. South of the Missouri it is one of the commonest of shells.

***Lampsilis ventricosa satura* (Lea).**

("Plain Pocket Book.")

Pl. XXVIII, Figs. 107 A—B.

1852—*Unio satur* Lea, Pr. Am. Phil. Soc., V., p. 252; Tr. Am. Phil. Soc., X. 1852, p. 205, pl. XXVII, fig. 19.

1900b—*Lampsilis ventricosus satur* (Lea) Simpson, Pr. U. S. Nat. Mus. XXII, p. 527.

ANIMAL CHARACTERS:—Identical in every way to the parent species.

SHELL CHARACTERS:—Also identical to the species except in its uni-coloration of epidermis which is rather a dark-brownish. All shells collected by the writer for this State are also smaller when mature.

Sex	Length	Height	Diameter	Locality
♀	88	x 55	x 45mm—	(Black R., Williamsville)
♂	75	x 54	x 42mm—	(White R., Hollister)

MISCELLANEOUS REMARKS:—This subspecies is only found in the Southwest. For this State it is definitely reported by Mr. Walker for the Black River., Popular Bluff. The writer collected some of these forms of *ventricosa* from the same stream a few miles north. The Black is a metropolis for *ventricosa* where it is found in all forms, since this species is liable to intergrading—*satura* being one of these intergradations. Yet its rayless character (like that of *capax*) would make it worthy of a name.

Genus *Truncilla* Rafinesque.(Type, *Truncilla triqueter* Rafinesque).1819—*Truncilla* Rafinesque, JI. de Phys. Chim. et Hist. Nat. pp. 427.

ANIMAL CHARACTERS:—Branchial opening densely set with papillae; anal crenulated; supra-anal well separated from the anal by a definite mantle connection; inner laminae of inner gills entirely connected with the visceral mass; outer gills greatly tapering anteriorly; palpi very small, post-dorsal margins entirely free; color of soft parts grayish, posterior margins of mantle black. Marsupia kidney-shaped, distended transversely as well as ventrad when gravid; formed by many ovisacs that occupy the posterior section of outer gill and extend down from the ventral edge of the original sterile gill in blunt, beaded unpigmented structures in state of gravidity; conglutinates not solid; glochidium medium in size, semicircular, hinge line very long, length about the same as height; post-ventral edge of marsupium doubled, the inner edge remote from outer forming a peculiar compartment as the highest specialization for the respiration of the embryos.

SHELL CHARACTERS:—Female shell very distinct from that of male, with a strong inflation or projection (marsupial expansion) in the post-ventral region which so changes its position and form that it assumes very many strange shapes; male shell not so modified post-ventrad, however, nodulous expansions do appear in some species; shell of either sex small, usually narrowly rounded in front much thicker anteriorly; beaks rather full, comparatively large, sculptured by double-looped ridges, usually obscure; epidermis yellowish or brownish, rayed with numerous fine green lines; cardinals and laterals usually single (or faintly double) in right valve, double in left; branchial cavity deep, basin-like; nacre white or bluish.

MISCELLANEOUS REMARKS:—This remarkable genus is the most modern due to the best possible adaptation to reproduction both as to the morphology of shell and soft parts. This correlation of the physiology to the morphology is best seen in the greatest specialization of the reproductive structures of the animal. Recognizing that the most recent classification of the *Unionidae* is based primarily upon the modification of the marsupium and that the genus *Truncilla* has carried out this sexual differentiation to the

greatest extent, Walker (1910c pp. 75-81) gives us the following systematic arrangement of *Truncillac* on the basis of reproduction:

- 1.—*Perplexa*—Group.—Marsupial expansion occupies the whole post-ventral area of shell.
- 2.—*Triquetra*—Group.—Marsupial expansion formed by the inflation of the post-umbonal ridge.
- 3.—*Foliata*—Group.—Marsupial expansion anterior to post-umbonal ridge and more or less separated from it.

These groups may in turn be subdivided because of the different forms and shifting position of the sexual expansion. The first and third groups are represented in this State by two new species, discovered by the writer in South Missouri streams, and their novelty acknowledged by Mr. Frierson of Frierson, Louisiana.

Truncilla Curtisii Frierson and Utterback. New Species.

("Curtis' Shell.")

Pl. VI, Figs. 14a-d; Pl. XXVIII, Figs. 109 A-D.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely bordered with papillae; anal crenulated; supra-anal high, rather small, separated from anal by moderately short mantle connection, mantle border here spotted; inner laminae of inner gills entirely connected to visceral mass; palpi very small connected only by their anterior base which is remote from the anterior attachment of pointed outer gill; color of soft parts grayish except the blackish mantle edge at siphonal openings.

REPRODUCTIVE STRUCTURES:—Marsupium very broad, rounded ventrad, kidney-shaped, ovisacs several, distinct occupying posterior half of outer gills and distended into beaded, unpigmented structures along ventral edge when gravid; conglutinates broken masses; glochidia unknown as only specimens gravid with early embryos have been obtained; inner mantle edge of female antero-ventrad to branchial opening drawn in toward the interior of shell forming a chamber.

SHELL CHARACTERS OF FEMALE:—Ovate, lacks flattened area of the disc, slightly emarginated just below post dorsal line; epidermis cloth-like, brownish-yellow, finely and obscurely radiate

all over; nacre white; the antero-extra pallial layer remarkably thickened; anterior muscle scars deep, the posterior lightly impressed and confluent; the pallial line reflected upward and inward in the post-half; cardinals double in each valve, small, high, acuminate, sulcate; sexual expansion thin, swollen, slightly radiately and concentrically ridged, denticulate on edge.

SHELL CHARACTERS OF MALE:—Shell much the smaller of the two (so far as noticed); rounded before, sinuous below, widely biangular behind, flattened over the umbones and to the post-base; post ridge widely double.

Beaks of both sexes remarkably heavily ridged, inclined to be doubly looped, but obtusely so in front, ridges heavy behind running downwards and backwards to the umbonal ridge. The earlier growth of the shell when looked at through a lens resembles in a striking way a diminutive *Amblema plicata* (Say.)

Sex	Length	Height	Diameter	Locality
♀	33 x	23 x	15 mm—	(White R., Hollister, Mo.)
♂	22.5 x	19.5 x	13.5 mm—	(White R., Hollister, Mo.)
♀	26.5 x	18.5 x	14 mm—	(White R., Hollister, Mo.)

MISCELLANEOUS REMARKS:—The position of this interesting species is exactly between *capsaeformis* Lea and *biemarginatus* Lea. From *capsaeformis* our species differs in the sexual enlargement being of the same general body color and in being more expanded or swollen in the middle and therefore not so regularly fan-shaped as in *capsaeformis* and our shell is not so regularly rounded behind. From *biemarginata* our species may be differentiated by its lack of pronounced angles and ridges of the former and by our species being much smaller and thinner and from its general almost solid piece color. *Our species differs most remarkably in the heavy beak sculpture.* From *deviatus* Anthony our shell similarly differs in color; and the sexual swelling is not so far protruded behind. A specimen of *deviatus*, recently procured, shows this species to have beaks nearly as heavily corrugate as our species and not, as Anthony supposed, nearly smooth as in *capsaeformis*. The presence of a form so intimately resembling those of the East Tennessee mountain streams in Missouri is of great interest.

The shell was taken by the co-author, W. I. Utterback, in the White River, Hollister, Mo., Aug. 26, 1913, and is named in honor of Dr. W. C. Curtis of the Department of Zoology, Univer-

sity of Missouri. The type shells, which are line-drawn and also photographed herewith, are now in the possession of Mr. Utterback.

Truncilla Lefevrei¹ Utterback. New Species.

("Lefevre's Shell.")

Pl. VI., Figs. 13 a—d; Pl. XXVIII., Figs. 108 A—D.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening thickly papillose; anal crenulated; supra-anal moderately connected to anal; outer gills shorter and only half as wide as inner gill, inner laminae entirely connected to visceral mass; outer gills drawn up high and pointed anteriorly forming wide gap between palpi and anterior attachment; palpi small, free their whole dorsal length; color of soft parts dingy white with squarish, blotched mantle edge around anal and supra-anal openings and solid blackish border at branchial opening.

REPRODUCTIVE STRUCTURES:—Marsupium formed by several ovisacs arranged in a kidney-shape, which, when gravid, extend down to the edge of inner gills forming a plain beaded border on the ventral edge; inner mantle edge anterior-ventrad to branchial opening drawn over into the interior of shell forming a compartment evidently as a water reservoir; no conglutinates nor glochidia observed.

SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell small, narrowly rounded before, solid anteriorly, thin posteriorly; general shape of both sexes ovate-trigonal; epidermis brownish-yellow, smooth, with fine, continuous rays; beaks rather large, full, too eroded to make

¹As may have been noted, the author has departed from the accepted Code of Nomenclature on *Naiades* in so far as to employ the *initial capital* for all names of those Species and Sub-Species derived from the *names of persons* when used substantively in both their respective binomial and trinomial forms. Although this action may seem somewhat presumptuous, yet the departure is surely justifiable on the grounds of efforts to be more consistent with clearness as to the nominal derivation and especially with the Latin and Greek etymology or diction. In this regard the suggestion of the Editor has been followed and reference would be made to his comments on "Proper Publication" (Am. Mid. Nat., Vol. IV., No. 3, pp. 95 and 96).

out sculpture. Female shell broader posteriorly, *marsupial expansion* formed post-ventrad, above basal line *just anterior to post-umbonal ridge* and bounded ventrad by a furrowed rest line. Male shell more trigonal in shape with post-umbonal ridge rather biangulated and with a very slight radial furrow in front; dorsal ridge rather prominent.

Internal structure of both sexes about the same except a higher mantle line in the female shell; cardinals double in both valves; laterals single in right, double in left; branchial cavities deeply basin-like; nacre blue with a tinge of yellow in the branchial cavity, iridescent posteriorly.

Sex	Length	Height	Diameter	Locality
♀	32	x 21	x 15mm—	(Black River, Williamsville)
♂	26.5	x 18	x 14mm—	(Black River, Williamsville)

MISCELLANEOUS REMARKS:—Although this rare Species has been found only in one locality yet a sufficient suite of shells was secured to establish its novelty. One specimen was obtained gravid with ova, yet it was sufficiently, although briefly, described afield before it was lost as often results in a rush of field work. At first the author was inclined to call this Species *T. triquetra*, but comparisons to actual shells of typical *triquetra* show that it is placed in the third group of *Truncilla* which is characterized by the marsupial expansion formed by the inflation just anterior to the post-umbonal ridge not extending below the basal line and in which group *triquetra* is not classed. *Lefevrei* differs from the *arcaeformis* of Lea in not possessing a radial depression in front of the post-dorsal ridge and in not having such a prominently curved post-umbonal ridge and also in not possessing such coarse hinge teeth. This new and most modern Species is dedicated to Dr. George Lefevre of the Department of Zoology in the University of Missouri. The discovery of this new Species from the Black River, Williamsville, Missouri, and also of the new *Truncilla*, *Curtisii* Frierson and Utterback, from the White River, Hollister, this State, and, being the only completely described *Truncillae* west of the Mississippi, it seems fitting that these should bear the names of the two associate authors and instructors who have contributed so much to the science of the *Naiades* in their monumental work, "*Studies on the Reproduction and Artificial Propagation of Fresh-Water Mussels.*"

(THE END)

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ERRATA.

(For Serial Numbers of Utterback on *The Naiades of Missouri*, Vol. IV.)

Some errors have been due partly to improper and insufficient corrections of the MS. which originally followed Lindahl's "Orthography of the Names of *Naiades*,"—an article that adheres strictly to the International Code. Most of the other errors are the typographical mistakes that usually escape even the most careful proof-reading.

VOL. IV., No. 3:—

Page 47, line 19, for "marsupial" read "marsupia"; line 40, for "*Magnonaias*" read "*Megalonaias*"; line 44, for "*Schoolcraftensis*" read "*schoolcraftensis*."

Page 49, line 7, for "Genus XII" read "Genus XIII"; line 19, for "*Ferussacianus*" read "*ferussacianus*"; line 29, for "Genus VXII" read "Genus XVII".

Page 50, line 39, for "*texensis*" read "*texasensis*."

Page 51, line 12, for "*Curtisi*" read "*Curtisii*" (This latter inflection really should occur for all Latinized substantives derived from names of persons terminated by a consonant).

VOL. IV, No. 4:—

Page 101, line 25, insert "inner" before "usually."

Page 102, line 11, for "*Unionae*" read "*Unionidae*"; line 18, for "The connection" read "the usual disconnection."

Page 103, line 32, for "*F. trigona*" read "*F. undata trigona*".

Page 104, line 4, omit comma after "hermaphroditic"; line 12, for "Plates I and I" read "Plates I and II".

Page 111, line 21, insert next line below this reference:—"Pl. XV., Figs. 34A and B".

Page 115, line 19, insert comma after "p. 71"

Page 118, line 6, for "*raripliplicata*" read "*rariplipicata*"

Page 119, line 24, for "these fact" read "this fact"; line 27, for "*quintardi*" read "*Quintardii* (All other errors regarding *Quintardii* read as corrected here).

Page 126, for Text-Fig. 3 A transpose "AN" and "PO".

Page 127, line 9, for "expecially" read "especially"; line 20, between "very" and "profusely" insert "compressed and".

Page 128, line 3, for "scupture" read "sculpture"; line 13, separate "glochidia" and "lying"; insert next line below:—"7.—No undulations in juvenile and adolescent shell as in *Amblemae*".

Page 130, line 10, for "charasterized" read "characterized".

Page 131, line 4, for all statements of "*Quadrula pustulosa* (Lea)" read "*Quadrula bullata* (Raf.)" as mentioned in the Foot-note for this page.

Page 136, line 38, for "*Udio*" read "*Unio*".

Page 137, line 22, for "tacytictic" read "tachytictic".

Page 143, line 2, for "tha" read "than".

Page 147, line 28, for "*wardii*" read "*Wardii*" (All other errors regarding the capitalization of "*Wardii*" read as corrected here).

Page 149, line 35, insert comma after "marsupial".

Page 150, line 37, for "wiite" read "white".

VOL. IV, No. 5:—

Page 184, line 17, for "state" read "State" (All other errors in the use of this word when its antedecedent is geographic, e. g., "Missouri," correct as read here).

Page 187, line 25, for "*Pleruobemae*" read "*Pleurobemae*".

Page 191, line 39, omit "Am."

Page 192, line 30, between "*catillus*" and "by" insert "not only" and between "but" and "its" insert "also by"; line 35, between "had" and "been" insert "also".

Page 195, line 18, for period use a comma after "North Missouri".

Page 196, line 2, of Foot-note for "group" read "group".

Page 199, line 13, for the first word, "of" read "or"; line 21, for "used" read "use".

Page 204, line 10, for "papli" read "palpi".

VOL. IV, No. 6:—

Page 245, in Text-Fig. 4, for "M" on inner gill read "I".

Page 248, line 36, for "umbona" read "umbonal"; line 39, for "vavles" read "valves".

Page 251, line 2, for "climed" read "claimed"; line 27, for "*Pterosygna*" read "*Pterosyna*".

Sub-Family III LAMPSILINAE:—

Marsupium differentiated with special ovisacs mostly arranged posteriorly near the post-ventral mantle margin specialized with crenulations, papillae, etc.; only outer gills marsupial; glochidium *Lampsilis Type*; *bradytic*.

Proptera Type
(Intermediate to modern form) of glochidium: Axehad shape, spined-spineless.

The *Spineless* glochidia are followed in the adult life by perfect and *complete* hinge teeth.

Lampsilis type, (Modern-Form) of glochidium:—Suboval-subelliptic, spineless.

This reversion of the modern form of glochidium to that of the primitive very strikingly shows that *ata-vism* characteristic of the principles of evolution.

Sub-Family II ANODONTINAE:—

Marsupium differentiated with lateral water tubes when gravid; post-ventral mantle margin undifferentiated; all four gills marsupial; glochidium *Anodonta Type*; *bradytic*.

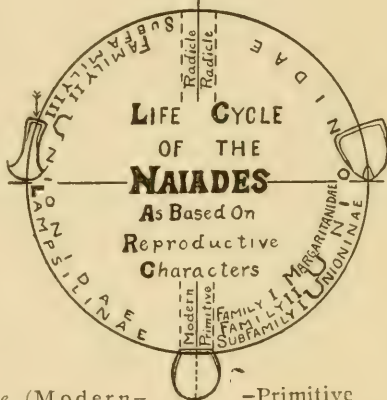
Anodonta Type
(Intermediate Form) of glochidium: Subtriangular, *spined*, followed in adult by *incomplete* hinge teeth.

Sub-Family I UNIONINAE:—

Undifferentiated marsupium and post-ventral mantle margin; all four (or outer) gills marsupial; *tachytic* species; glochidia *Lampsilis Type*.

Family I MARGARITANIDAE:—

Marsupium more primitive than that of Family II; post-ventral mantle margin undifferentiated; all four gills marsupial; glochidium *Lampsilis Type*; *tachytic*



Page 252, line 19, for "bue" read "blue".

Page 254, line 27, for the adverb. "ventrad" read as adjective, "ventral".

Page 255, line 33, insert next line below:—" (Type, *Lastena ohiensis* Raf.);" line 36, separate "outer" and "and".

Page 256, line 26, for "p." read "Pl."; line 36, for "pericardinal" read "pericardial".

Page 257, line 10, omit comma after "distinct" and supply after "veining".

Page 258, in Text-Fig. 7, transpose "AN" and "PO".

Page 262, line 33, for "browasih" read "brownish-yellow".

Page 263, line 22, for "moss" read "mass"; line 33, for "mosses" read "masses".

Page 268, line 35, insert next line below:—" (Type, *Anodonta ferusaciana* Lea)"

Page 269, line 6, omit "External Structures"; line 18, add "about" after "being".

Page 270, line 30, insert next line below:—" (*Alasmidonta undulata* Say)"

Page 273, line 26, for "known" read "shown".

VOL. IV, No. 7:—

Page 312, line 10, before "containing" insert "each" and for comma use semi-colon after "larvae" and also omit "are"; line 11, omit "situated"; line 12, for "min" read "mm"; line 16, for "obtusely" read "obtuse".

Page 317, line 34, for "*facsiolaris*" read "*fasciolaris*"; as indicated in Foot-note for this page, for all statements of "*Ellipsaria clintonensis* (Simpson)" read "*Ellipsaria occidentalis* (Conrad)".

Page 318, line 7, for period after "p. 301" use semi-colon.

Page 320, line 8, use semi-colon after "interdentum".

Page 321, line 22, for "nodulat" read "nodulated".

Page 324, line 2, for "J" read "Jl."; line 16, omit comma after "height".

VOL. IV, No. 8:—

Page 343, line 30, for "*pleasii*" read "*Peasii*"; (do. page 344, line 29; do. page 345, line 20); line 32, for "clolored" read "colored".

Page 345, line 26, for "*utterbackii*" read "*Utterbackii*"; (do. line 31).

Page 348, line 18, insert "IX" after "pl".

Page 352, line 15, for "*simpsoni*" read "*Simpsoni*"; (do. page 387, line 3).

Page 353, line 38, for "bysuss" read "byssus".

VOL. IV, No. 9:—

Page 387, line 34, for "*teniussimus*" read "*tenuissimus*".

Page 391, line 28, for "*Lamack*" read "*Lamarck*".

Page 392, line 14, for "more" read "not" and for "not" read "nor".

Page 395, line 34, for "*proptera*" read "*Proptera*".

Page 396, line 20, for "*texsasensis*" read "*texasensis*".

Page 400, line 6, for "central" read "center"; after line 10 supply the following deletion from text:—

SHELL CHARACTERS:—Shell elliptical, small or medium, beak sculpture rather double-looped or distinctly sinuate with posterior sinuation somewhat open.

ERRATA.

(PLATES I—XXVIII.)

Pl. I, Fig. 2, for "yavel" read "valve".

Pl. II, Fig. 5a, Supply label 4, i. e., "Extreme dorsal point."

Pl. V, Fig. 12b, for "*Utterbacki*" read "*Utterbackii*"; do. Pl. XX, Figs. 63 A—D.

Pl. VI, Figs. 14 a—d, for "*Curtisi*" read "*Curtisii*"; do. Pl. XXVIII, Figs. 109 A—D.

Pl. IX, Fig. 19, After "feeding" supply comma and "respiring".

Pl. XIII, Fig. 26, Supply "—Hundred" after "One;" do. Pl. XXVI, Fig. 90.

Pl. XVI, Figs. 38 A—D, for "*Quintardi*" read "*Quintardii*".

Pl. XIX, Fig. 52, for "*cylindirca*" read "*cylindrica*".

Pl. XXV, Fig. 81, for "*clintonesnsis*" read "*clintonensis*".

Pl. XXVIII, Fig. 107, for "*ventricoas*" read "*ventricosa*".

||CLEISTOGAMOUS FLOWERS IN THE PANSIES.

BY J. A. NIEUWLAND.

In a former article¹ where reference was made to the presence or absence of cleistogamous flowers in certain groups of violets it was supposed that the pansies were devoid of this peculiar form of self-fertilization. For more than a year we have suspected the possibility of ceistogamay in certain members of the Mnemion group, and particularly in *Viola Rafinesquii*, Greene. Dr. Greene himself first called our attention to the fact that he believed the first flower that appeared on the young plant in spring is "apetalous." Ever since then we have sought an opportunity of examining young plants of *V. Rafinesquii* in order to determine their presence or absence. Such a chance was offered for the first time

¹Am. Mid. Nat. III. 207 et seq. (1914.)

when Mr. B. F. Bush early this season sent us some excellent fresh material of the plant from Courtney, Missouri.

Wittrock² in his extensive and thorough work on the pansies makes reference to certain small-petalled flowers of *V. arvensis* Murr., which he refers to as "*Klāndestina blommorna*," and intimates they are rather well known. A beautiful plate (Tafl. V. a, 70D. 70E). illustrates the fact of much reduced corolla in that plant. None of his drawings, however, show what might be called cleistogamous flowers in the true sense, i. e., those having completely and permanently closed calyx and reduced number of stamens, these latter changed completely in shape of anthers and smaller pollen grains. Wittrock, moreover, does not refer to *V. Rafinesquii*, Greene, as the American plant. Dr. Greene had showed this to be separate a year after and Wittrock had presumably not taken the American plant, if he had seen it, to be different from the European. In fact his references to the origin of the plants rather precludes that any American specimens should have been referred to. Muhlenberg had given the American plant the name *V. tenella* a preoccupied one, but this reference is not even mentioned by Wittrock so that he must have been quite unaware of its identity, or of the distinctive character of the American plant as ever having been mentioned.

Examination of Mr. Bush's specimens revealed the fact that not only is the first flower of *V. Rafinesquii* really cleistogamous, but often the first flower of many of the later basal branches is decidedly apetalous also. The structure of these flowers is in no essential way different from those of the other violets. They show even a more pronounced tendency to have only two very much modified stamens, rather than five as in the caulescent members of the *Lophion* group. (e.g. *V.* or *L. rostratum*). The sepals are rather unequal and always closed completely and permanently over the inner parts. The stamens are club-shaped as in the other group, much smaller, and each with two obovate anthers closely appressed to the characteristically recurved stigma. This latter is quite different in shape and structure from that of the petaliferous flowers. The style is shortened and the stigma reduced and recurved and held in the clasp of the two stamen tips. The pollen germinates without, in most cases, leaving the anther cells and the tubes grow directly into the hollowed style.

² Wittrock, V. B. Acta Horti Bergiani II, No. 1, p. 25, (1897).

The petals are either totally absent or represented by short linear appendages, and are usually, when present at all, of reduced number. In this case the three abortive stamens are reduced to small appendages or mere pimples. The disappearance of the regular number of stamens and petals is gradual, as in the other stemmed violets (e. g. *V. canadensis* and *V. striata*.)

The presence of cleistogamous flowers in the *Mnemion* group in no way militates directly against the recognition of it as a separate genus, as there are other characters that prompted botanists as early as the very dawn of the science to consider *Viola tricolor* and its associates separate from *Viola odorata*. Ruellius as early as 1542 gave this the name *Pensea* derived from the French *Pensée* whence the common name *Pansy* came. In fact since the cleistogamous flowers in this group when present come before rather than later as in the common violets, it shows that they are of a very different nature having the same character under entirely opposite ecological and physiological conditions. In this sense this very identical characteristic is itself an indication of distinctiveness.

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"The Genus *Phoradendron*," by William Trelease, Professor of Botany in the University of Illinois, published by the University early in June, is a royal octavo volume, containing 224 pages and 245 plates, with a distribution map.

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The work may be secured from the University of Illinois. Price, in paper, \$2.00; cloth, \$2.50 net.

VOL. IV.

SEPTEMBER, 1916.

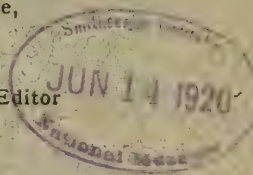
NO. II.

THE AMERICAN MIDLAND NATURALIST

Devoted to Natural History, Primarily
that of the Prairie States

Published by the University of Notre Dame,
Notre Dame, Indiana

J. A. NIEUWLAND, C. S. C., Ph. D., Sc. D., Editor



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NO. II.

ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—VIII.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—VIII.

With Notes by J. Lunell.

ORDER GRUINALES Gerard, Fl. Galloprov. 430. (1761.)

Family 66. **GERANIACEAE** J. St. Hill. Expos. Fam. 2:51. (1805).

Geraniales Lindley, Nix Pl. 16. (1833).

GERANIUM Dios. 3: 131 = *G. tuberosum* acc. to Fraas and Daubeney. Linn. Gen. n. 832.

673. **Geranium columbinum** Dodonaeus, Prium Prov. de Stirp. Hist. 48. (1553), also Pempt. 61. (1583). Linn. Sp. Pl. 682. (1753).

Grows in Dakota, acc. to the Manuals.

674. **Geranium carolinianum** Linn. Sp. Pl. 682. (1753).

Along the Red River of the North.

ERODIUM L'Herit.; Ait. Hort. Kew 2: 414. (1789).

Geranium Plinius 26: 11. Γεράνιον ἕτερον Diosc. 1. c., acc. to Dod. 1. c. 47.

675. **Erodium cicutarium** L'Herit., 1. c.

Geranium cicutarium Linn. Sp. Pl. 680. (1753).

Dunsieth; Fargo (Cl. Waldron).

Family 67. **OXALIDACEAE** Lindl. Nat. Syst. ed. 2: 140. (1836).

Oxys Plinius, Nat. Hist. 27:12, vel. 89. Nicander Ther. 840, is older than *Ovalis* Linn, which name was applied by the ancients to some *Rumex* or *Lapathum* species.

Oxys Pliniana Gesner. Hort. Germ. = *Oxalis Acetosella* Linn., the type of the genus. Not found in the State.

IONOXALIS Small, Fl. S. E. U. S. 665. (1903). This name and *Ceratoxalis* are acceptable of course only through the elimination of *Oxalis* as a genus name.

676. *Ionoxalis violacea* (Linn.) Small, l. c.

Oxalis violacea Linn. Sp. Pl. 434. (1903).

Kulm (Brenckle).

CERATOXALIS Dumortier, Fl. Belg. Stam. III. (1827) as subgenus!

Xanthoxalis Small, l. c. 666. (1903).

677. *Ceratoxalis stricta* (Linn.) Lunell.

Oxalis stricta Linn. Sp. Pl. 435. (1753).

Oxalis corniculata stricta Sav. in Lam. Encycl. 4: (1797).

Xanthoxalis stricta (Linn.) Small, F. S. E. U. S. 667. (1903.)

Leeds, Butte.

678. *Ceratoxalis cymosa* (Small) Lunell.

Oxalis cymosa Small in Bull. Torr. Bot. Club. 23: 267. (1896).

Xanthoxalis cymosa Small. l. c. 668. (1903).

Devils Lake, Minot; Fargo (O. A. Stevens); Beaver Creek in Emmons Co. (Brenckle).

679. *Ceratoxalis coloradensis* (Rydb.) Lunell.

Xanthoxalis coloradensis Rydb. Fl. of Colorado 220. (1906).

Dunsieth.

Family 68. **LINACEAE** Dumort. Comm. Bot. 61. (1822).

LINUM Theoph. Hist. 8: 7. Cam. 3:21. Diosc. 2:125. Plinius 19:19. Colum. 2:10. Virg. Georg. 1: 77. Tour. Élé. 282. (1694). Linn. Gen. 135. (1754), and all other authors.

680. *Linum sativum* Tour. l. c.

Linum usitatissimum Linn. Sp. Pl. 277. (1753).

Leeds, Butte.

681. *Linum Lewisii* Pursh, Fl. Am. Sept. 210. (1814).

Linum perenne var. *Lewisii* Eat. & Wright, N. Am. Bot. 302. (1840).

Leeds, Butte.

NEZERA Rafinesque, New. Fl. Am. IV: 64. (1836).

Linocarpus Thalius, Sylva Hercyn. 72. (1588), and *Cathartolimum* Reichenb., Handb. 306. (1837), both names void as built on *Linum*.

682. *Nezera sulcata* (Riddell) Nwd. in Am. Midl. Nat. III.: 152. (1913).

Linum sulcatum Riddell, Suppl. Cat. Ohio Pl. 10. (1836).

Cathartolinum sulcatum (Riddell) Small, N. Am. Fl. 25: 78. (1907).

Linum Boottii Planch. Lond. Journ. Bot. 7: 475. (1848).

Linum simplex Wood, Bot. & Flor. 66. (1870)?

Leeds, Butte.

683. *Nezera rigida* (Pursh) Nwd. in Am. Midl. Nat. 1. c.

Linum rigidum Pursh) Fl. Am. Sept. 210. (1814.) *Cathartolinum rigidum* (Pursh.) Small, l. c. 82.

Butte, Pleasant Lake, Minot.

Family 69. **RUTACEAE** Jussieu Gen. 296. (1789).

XANTHOXYLUM Pluck. Alm. 396. (1696), also Almath. 214. (1705); cor. P. Miller, Gard. Dict. ed. 8: 2. (1768).

684. *Xanthoxylum americanum* Mill., l. c.

Fargo (O. A. Stevens).

Family 70. **POLYGALEAE** Reichenb. Consp. 120. (1828).

POLYGALA Diosc. (?) *Polygalon* Diosc. (?) 4: 196. *Polygala* Plinius 27: 12 & 96, also Linn. Gen. 315. (1754), inclusive of *Heisteria* Linn. Gen. 357. (1737) & *Polygaloides* Tour. and *Chamaebuxus* Tour. *Polygala* Tour. Élém. 143. (1694).

685. *Polygala verticillata* Linn. Sp. Pl. 706. (1753).

Leeds, Butte.

686. *Polygala Senega* Linn. Sp. Pl. 704. (1753). Snakeroot.*

Leeds, Butte, Oberon, Hurricane Lake.

687. *Polygala Torreyi* Don. Syst. I: 360. (1831).

Polygala alba Nutt. Gen. II: 87. (1818), not *P. alba* Buchoz, Dict. III: 38. (1770). Vide Greene, Pittonia III: 307. (1898).

Minot.

Family 71. **EUPHORBIACEAE** J. St. Hil. Expos. Fam. 276. (1805).

TITHYMALUS Hippocrates. Dioscorides 4: 162. Theophrastus Hist. Pl. 9: 12. Plinius. Tour. and most of the older botanists. Referred by Linn. to *Euphorbia* Gen. 208. (1754). *Euphorbium* Isnard (1720). *Euphorbia* of the ancients = *E. antiquorum* is quite a different type.

*In this State this is the only medicinal plant for which there is a market, though on account of its low price, only the Indians avail themselves of this opportunity for earning.

688. **Tithymalus missouriensis** (Norton) Small, Fl. South-east, U. S. 721. (1903).

Euphorbia arkansana missouriensis Norton, Rep. Mo. Bot. Gard. 11: 103. (1899).

Fargo (O. A. Stevens); Medora (Bergman).

689. **Tithymalus Esula** (Linn.) Hill. Hort. Kew 174 (4). (1768); perhaps identical with *T. cupressinus* Tab. or *T. pinea* Lobel. (1576).

Euphorbia Esula Linn. Sp. Pl. 461. (1753).

Fargo (O. A. Stevens).

690. **Tithymalus Cyparissias** Diosc. 4: 165 (τιθύμαλος κυπαρίσσιος) acc. to Daubeny.

Euphorbia Cyparissias Linn. Sp. Pl. 461. (1753).

Leeds.

691. **Tithymalus Peplus** Dioscorides 4: 165. Hill, Hort Kew (172) (3) No. 1. (1768).

Euphorbia Peplus Linn. Sp. Pl. 456. (1753).

Leeds.

CHAMAESYCE Dioscorides 4: 167. Plinius 24: 15.

ANALYTICAL KEY (no: ris 692—696).

I. Seeds with 5 to 6 transverse wrinkles.

a) Stem leaves slightly serrulate toward the obtuse apex. . . *C. glyptosperma*

b) Stem leaves entire. *C. glyptosperma* var. *integrata*

II. Seeds with 4 transverse wrinkles, stem leaves serrulate from the upper part of one margin along the whole other margin.

a) Prostrate. *C. aequata*

b) Spreading. *C. aequata* var. *claudicans*

c) Erect. *C. aequata* var. *erecta*

692. **Chamaesyce glyptosperma** (Engelm.) Small, Fl. South-east, U. S. 712. (1903).

Euphorbia glyptosperma Engélm in Torr. U. S. & Mex. Bound Bot. 187. (1859).

Devils Lake, Leeds; Kulm (Brenckle).

693. **Chamaesyce glyptosperma** var. *integrata* Lunell in Am Midl. Nat. Vol. III: 142. (1913).

Leeds.

694. **Chamaesyce aequata** Lunell in Am. Midl. Nat. Vol. I: 204. (1910).

Leeds.

695. *Chamaesyce aequata* var. *claudicans* Lunell in Am Midl. Nat. Vol. I: 205. (1910).

Leeds.

696. *Chamaesyce aequata* var. *erecta* Lunell.

Chamaesyce erecta Lunell in Am. Midl. Nat. Vol I: 206. (1910.)

697. *Chamaesyce serpens* (H. B. K.) Small, Fl. Southeast. U. S. 709. (1903).

Euphorbia serpens H. B. K. Nov. Gen. & Sp. 2: 52. (1817).

Kathryn (Bergman).

698. *Chamaesyce maculata* (Linn.) Small, Fl. Southeast, U. S. 713. (1903).

Euphorbia maculata Linn. Sp. Pl. 455. (1753).

Fargo (Cl. Waldron & O. A. Stevens).

Family 72. **CALLITRICHACEAE** Lindl. Nat. Syst. ed. 2: 191. (1836).

STELLINA Bubani, Nuov. Giorn. Bot. Ital. V: 318. (1873) and Flor. Pyr. I: 85. (1897), to replace *Stellaria*, this being unfit as a name.

Callitriche Linn., not Nikander, Plinius.

699. *Stellina palustris* (Linn.) Lunell.

Callitriche palustris Linn. Sp. Pl. 969. (1753).

Leeds; Dickinson (C. Waldron).

Family 73. **ANACARDIACEAE** Lindl. Nat. Syst. (1830).

RHUS Hippocr. Nat. Mult. 572. Theophr. Hist. Pl. 3:18. Diosc. 2:147. Plinius 24:11. Cels. 6:11. Colum. 12:41. L. Hoff. G. Medic. Officin. 1:2, c. 197, p. 495. Linn. Gen. n. 361.

700. *Rhus virginiana* C. Bauhin, Pinax 521. (1623), also Tour. Éls. 444. (1694). (Cor.).

Datisca hirta Linn. Sp. Pl. 1037. (1753).

Rhus hirta (Linn.) Sudw. Bull. Tor. Bot. Club 19:82. (1892).

Rhus typhina Linn. Amoen. Acad. 4:311. (1760).

Traill Co.: Hillsboro (John E. Paulson).

701. *Rhus angustiarum* Lunell in Am. Midl. Nat. Vol. III.: 144. (1913).

Narrows; Fargo (O. A. Stevens & Cl. Waldron).

SCHMALTZIA Desv. Jour. Bot. 229. (1813).

702. *Schmaltzia trilobata* (Nutt.) Greene in Leaflets I. 132. (1905).

Rhus trilobata Nutt.; T & G. Fl. N. Am. I: 219. (1838).

Rhus aromatica var. *trilobata* A. Gray.; S. Wats. Bot. King's Exp. 53. (1871).

Temrick, Emmons Co. (Brenckle); Sentinel Butte (Bergman).

TOXOCODENDRON Tour. Élé. 483. (1694).

703. *Toxicodendron vulgare* Dill., Hort. Eltham II: 389. (1732), also Miller, Gard. Dict. no. I. (1768).

Toxicodendron radicans (Linn.) Kuntze, Rev. Gen. 153. (1891).

Rhus radicans Linn. Sp. Pl. 266. (1753).

Along the Missouri (McKenzie Co.)

704. *Toxicodendron Rydbergii* (Small) Greene, Leaflets I: 117. (1905).

Rhus Rydbergii Small in Rydberg's Fl. of Montana 268. (1900).

On the banks of the Souris River, at Towner.

705. *Toxicodendron desertorum* Lunell in Am. Midl. Nat. Vol. II: 185. (1912).

Sand Hills (McHenry Co.), Pleasant Lake.

706. *Toxicodendron fothergilloides* Lunell in Am. Midl. Nat. Vol. II: 186. (1912).

Devils Lake.

Family 74. **CELASTRINEAE** DC. Prodr. II.: 273. (1825).

Celastraceae Lindl. Nat. Syst. ed. 2: 119. (1836).

CELASTRUS Linn. Gen. 59. (1737) and 91. (1754).

Euonymoides Insnard, Act. G. p. 369. (1716); built on *Euonymus*.

707. *Celastrus scandens* Linn. Spl. Pl. 196. (1753).

Devils Lake, Turtle Mountains.

Family 75. **ACERACEAE** J St. Hil. Expos. Fam. II: 15. (1805).

Acer Ovid. 1, 11, 28 and the Romans and nearly all writers, ancient and modern. Tour. Inst. 615. Linn. Gen. 1155.

Sphendammus Theophr. Hist. 3: 11.

708. *Acer saccharinum* Linn. Sp. Pl. 1055. (1753).

Leeds.

RULAC Adanson, Fam. des. Plantes, Vol. II: 283. (1763).

709. *Rulac Nuttallii* Nwd. in Am. Midl. Nat. Vol. II: 137. (1911).

Negundo 1. *Acer fraxinifolium* Nutt. Gen. I: 253. (1818), not

Negundium fraxinifolium Raf. Med. Rep. Vol. V. 2nd Hexade, p. 352. (1808).

Turtle Mountains, Devil's Lake, Peninsula of Lake Ibsen, Pleasant Lake.

Family 76. **HIPPOCASTANACEAE** T. & G. Fl. N. A. I: 250. (1838).

Aesculaccae Lindley, Arb. Dict. I:155. (1841).

HIPPOCASTANUM Tour. Flémens 485. (1694).

Aesculus Linn. Gen. 109. (1737) and 161. (1754), not *Esculus* Plinius and the ancients = *Quercus Esculus* Linn.

710. **Hippocastanum vulgare** Tour. l. c.

Aesculus Hippocastanum Linn. Sp. Pl. 344. (1753).

Leeds (in cultivation).

"Hippo-Castanum est confarcinatum nomen (Phil. Bot. 225), nec synonyma alia supersunt, assumi itaque *Esculum* veterum cum castaneae et fagi fructus figura affinis videatur, quae omnes apud veteres sub *Quercus* militarunt nomine."—Ex. Linn. Hort. Cliff. 142. (1737).*

Family 77. **BALSAMINEAE** DC. Prodr. I: 684. (1824).

Balsaminariae Lindley, Nat. Syst. ed. 2: 138. (1836).

CHRYSAEA Cusa in Dalech. Hist. Pl. Lugd. p. 896. (1587).

This is the oldest name, but no one took it up. Later were added species with differently colored flowers, but this ought not necessarily make the name invalid. Cfr. *Chrysanthemum*, etc.

Balsamina. The oldest application of this name (*B. prima*) is to *Momordica Balsamina* eq. Ruellius Hist. 660. (1543), also Fuchs., Anguillara, Gesner, Lob., Tab., Cam., Ger. Cast. etc. etc.

Balsamina altera Tragus Hist. 105. (1749) and Stirp. Hist. 190. (1546). *Balsamina* Bauhin, Pinax 306. (1625), Tournef. and many of the older authors. It was usually called *Noli-metangere*, and *Impatiens*, Rivinus, Tetrapet, 246. (1681) [= *Impatiens herba* Dod. Pemp. (1503)] was the name taken up by Linnaeus.

711. **Chrysaea biflora** (Watt.) Nwd. & Lll., nov. comb.

Impatiens biflora Walt. Fl. Car. 219. (1788).

Impatiens fulva Nutt. Gen. I: 146. (1818).

*Nostra sententia minime recte fecit Linnaeus, *Esculus* vero nomen male a Linnaeo assumptum, qui quoque mentitus est de nomine Tournefortiano. Non enim habet Tournefortius Hippo-Castanum ut Linnaeus nos credere vult, sed *Hippocastanum* ut l. c. supra. His adjectis dicere possumus Linnaeum valde pejora habere nomina suis in operibus quam hoc *Hippocastanum*! Omnino melius est *Hippocastanum* T. quam *Aesculus* vel *Esculus* Linn., eo quod *Quercus* speciem significat Plinianam, ut Linnaeus ipse confitetur, et Tournefortianum nomen est et novum et usu veterius.—Nwd.

Pleasant Lake, Turtle Mountains.

712. *Chrysaea aurea* (Muhl.) Nwd. & Lll., nov. comb. Accidentally there is an excess of "gold" in this name, but perhaps not unreasonably. As we cannot recollect ever having seen the color of unadulterated gold we cannot judge!

Impatiens aurea Muhl. Cat. 26. (1813).

Impatiens pallida Nutt. Gen. I: 146. (1818).

Wild Rice (O. A. Stevens).

Family 78. **RHAMNEAE** J. St. Hil. Expos. Fam. II: 264. (1805).

Rhamnaceae Desv. p. 355. (1827), Lindl. Nat. Syst. ed. 2: 20. (1836).

APETLOTHAMNUS Nwd. (name modified in order to comply with the rules of the writer).

Apetlorhamnus Nwd. in Am. Midl. Nat. Vol. IV: 90. (1915). Built on *Rhamnus*, which cannot be eliminated as a genus name.

Rhamnus Theophr. 3: 17. Diosc. I: 114. Plin. 24: 14. Colum. 10: 373, and all authors. In part.

713. *Apetlothamnus alnifolia* (L'Her.) Nwd. [modif.].

Apetlorhamnus alnifolia (L'Her.) Nwd. l. c.

Rhamnus alnifolia L'Her. Sert. Angl. 5. (1788).

Girtanneria alnifolia (L'Her.) Raf. Sylv. Tellur. 28. This genus was named by Necker, having acc. to him a double perianth, and cannot hold for our species, which has only one perianth set.

Walhalla (L. R. Waldron).

Family 79. **AMPELIDEAE** H. B. K. Nov. Gen. V: 222. (1821)

Vitaceae Lindley, Nat. Syst. ed. 2: 30. (1836).

VITIS Plinius 14:3, and of latin writers and all later authors, *Ampelos* of Greeks.

714. *Vitis vulpina* Linn. Sp. Pl. 203. (1753).

Vitis riparia Michx. Fol. Bor. Am. 2: 231. (1803).

Minot.

PSEDERA Necker, Élé. I: 152. (1790).

Parthenocissus Planch. in DC. Mon. Phan. 5: p. 2, 447. (1887) Name built on *Cissus*.

715. *Psedera vitacea* (Knerr) Greene, Leaflets I: 220. (1906).

Ampelopsis quinquefolia var. *vitacea* Knerr, Bot. Gaz. 18:71. (1893).

Parthenocissus vitacea (Knerr.) Hitchc. Spr. Fl. Manhattan 26. (1894).

Butte, Peninsula of Lake Ibsen, Pleasant Lake, Bismarck.

Family 80. **TILIACEAE** Gerard, Fl. Galloprov. 436. (1761).

TILIA Plinius 16: 14, 24: 8, and all of older writers. See Virgilius, etc.

716. *Tilia americana* Linn. Sp. Pl. 514. (1753).

Fargo (O. A. Stevens).

Family 81. **COLUMNIFERAE** Zinn. Cat. Pl. 151 (1757).

Malvaceae Necker, Act. Acad. Theod. 2: 487. (1770).

MALVA Plinius 20: 21. Colum. 10: 247. Geopon 15: 5, 6, and all older and later authors. *Malache* Hesiod. and of Greeks. Theophr. Hist. 7: 8. Diosc. 2: 144, etc. Linn. Gen. no. 841.

Tragus, Hist. 174. (1546) used binary distinctive names whenever a *genus* held more than one species: *M. pumila* = *M. rotundifolia*; *M. hortensis* = *Alcea rosea*; *M. sylvestris* = *M. sylvestris*; *M. arborescens* = *Lavatera arborea*.

ANALYTICAL KEY.

- I. Plant erect, leaves crisp, flower and fruit sessile. *M. crispa*.
- II. Plant erect, pedicels erect in fruit, petals 3-4 times longer than the calyx, carpels about 10, with flat backs, rugose-reticulate.
 - a) Leaves with triangular lobes, petals elongated-cuneiform, emarginate, reddish violet with dark veins. *M. sylvestris*.
 - b) Leaves with rounded lobes, petals broadly obcordate, darker, almost crimson red. *M. mauritiana*.
- III. Plant procumbent, pedicels reclined in fruit, petals at most twice as long as the calyx.
 - A. Fruiting calyx not enlarging or reflexed.
 - a) Bractlets of the involucre lanceolate, $\frac{1}{2}$ as long as the calyx lobes, which are long-acuminate with propendent pilosity. Petals $1\frac{1}{2}$ —2 times longer than the calyx, pale blue or pale rosy. The center of the fruit $\frac{2}{3}$ of its diam. Carpels rounded on the back, 12—16, smooth. *M. neglecta*.
 - b) Bractlets of the involucre sublulate, as long as the calyx lobes, which are short-acuminate, with hairs spreading in all directions. Petals scarcely longer than the calyx, white. The center of the fruit only $\frac{1}{5}$ of its diam. Carpels with flat back and sharp angles. 10, rugose. *M. vulgaris*.
 - B. Fruiting calyx enlarging and becoming reflex-spreading. Petals scarcely longer than the calyx, blue. Carpels transversely rugose with smooth angles, 10. *M. parviflora*.

717. *Malva crispa* Linn. Sp. pl. ed. 2: 970. (1763).

Kulm. Brenckle).

718. *Malva sylvestris* Turner, Ger. I. Herb. Suppl. 785.

(1597). Homerus, Theophr., Diosc., etc. *Μαλὰ λυγρὰ τρυφά* Diosc., acc to Daubeney, Roman Husbandry (1857). Linn. Sp. Pl. 689. (1753).

Towner.

719. *Malva mauritiana* Linn. Sp. Pl. 689. (1753).

Malva hederacea Matthioli, Castor Durante (?).

Leeds.

720. *Malva neglecta* Wallr. Syll. Ratisb. I: 140. (1824).
Neuman Sveriges Flora. 287. (1901).

Malva nicaeensis Allioni, Fl. Pedem, 2: p. 40 (1785)?¹ Not Am. authors*

Malva rotundifolia of American authors. Not Linn.

Fargo (O. A. Stevens); Leeds.

721. *Malva vulgaris* Tragus, Stirp. Hist. 369. (1543), Fries, Novit. Fl. Sv. ed. 2: no. 212.

Malva rotundifolia Linn. Sp. Pl. 688. (1753).

Leeds; Carrington (O. A. Stevens); Kulm, (Brenckle).

722. *Malva parviflora* Linn. Amoen Acad. 3: 416. (1756).

Leeds.

NOTOTRICHE Turcz. Bull. Soc. Nat. Mosc. I: 567. (1863).

Malvastrum A. Gray, Mem. Am. Acad. (II) 4: 21. (1848).

Name unfit as built on *Malva*.

723. *Nototriche coccinea* (Pursh) Nwd. & Lll.

Malvastrum coccineum (Pursh) A. Gray, l. c.

Cristaria coccinea Pursh, Fl. Am. Sept. 454. (1814).

Leeds.

HIBISCUS (gr. ἰβίσκος) Dioscorides; Linn. Phil. Bot. 191. (1751).

724. *Hibiscus Trionum* Linn. Sp. Pl. 697. (1753).

Acc to Sibthorp, Gr. Pr. 2, n. 1632, *Alcea* "Ἀλκαῖα Diosc., is *Hibiscus Trionum*, but Bubani disproves this assertion.

Leeds.

Family 82. **HYPERICACEAE** Lindl. Nat. Syst. ed. 2: 77. (1836).

HYPERICUM Diosc. 3: 161 also Hippocr. Morb. Mult.

*Allioni has a rather extensive description of this plant, but without mentioning the essential "points." *Flores calyce paulo maiores* appears, if anything, to indicate another species. Bubani seems to hold them different, as he otherwise no doubt would have placed *M. neglecta* as a synonym to *M. nicaeensis*.

I: 610, Plinius 26: 8, 27: 4, 5, and of most older writers = *H. crispum*. Linn. Gen. no. 902.

Ascyrum Diosc. 3: 162 = *H. perforatum* Linn. (Britton calls this type of *Hypericum*!)

Androsaemum Diosc. 3: 163 = *H. perfoliatum*.

Ageratum Plinius 27: 4 = *H. origanifolium*, & s. f.

725. ***Hypericum maius*** (A. Gray) Britton, Mem. Torr. Bot. Club 5: 225. (1894).

Hypericum canadense maius A. Gray, Man. ed. 5: 86. (1867).
Leeds, Butte.

Family 83. **ELATINACEAE** Lindl. Nat. Syst. ed. 2: 88. (1836).

ILYPHILOS (gr. ἰλῦς mud, φίλος friend) Lunell, nom. nov.

Elatine Diosc. and others = *Linaria Elatine*, *Linaria segetum*, *Echinospermum vulgare*, *Polygonum dumetorum*, *Chamaeclema hederacea*, *Campanula*, *Specularia arvensis*, *Veronicae varia* (Bubani). *Elatine* Linn. Gen. n. 502. *Alsinastrum* Tour built on *Alsine*.

726. ***Ilyphilos triandrus*** (Schk.) Lunell.

Elatine triandra Schk. Bot. Hand. I: 345. (1791).

Wild Rice (O. A. Stevens); Kulm (Brenckle, no 337); Leeds.

Family 84. **VIOLACEAE** DC. Fl. Franc. 4: 801. (1805).

VIOLA Homer. Od. 5: 72 = ἰων, Diosc. 4: 120, Plinius 21: 6, Apic. I: 4, and all latin and subsequent writers. Tournefort, Inst. 419. t. 236. Linn. Gen. n. 1007.

727. ***Viola pedatifida*** Don. Gard. Dict. I: 320. (1831).

Viola delphinifolia Nutt.; T. & G. Fl. N. Am. I: 136. (1838).

Leeds, Butte, Pleasant Lake.

728. ***Viola nephrophylla*** Greene, Pittonia 3: 144. (1896).

Butte, Pleasant Lake, Sheyenne, Turtle Mountains.

729. ***Viola Lunellii*** Greene, Leaflets II: 95. (1910).

Leeds.

730. ***Viola papilionacea*** Pursh, Fl. Am. Sept. Vol. I: 173. (1814).

Fargo (Cl. Waldron).

731. ***Viola sororia*** Willd. Enum. 263. (1809).

Fargo (Bergman).

732. ***Viola pratincola*** Greene, Pittonia Vol. IV: 64. (1899).

Peninsula of Lake Ibsen, Minot; Dickinson (Cl. Waldron),
Medora (Cl. Waldron).

CROCION Nieuwland and Kaczmarek, in Am Midl. Nat. Vol. III.: 214. (1814).

733. *Crocion achlydophyllum* (Greene) Kaczmarek in Am. Midl. Nat. Vol. IV: 74. (1915).

Viola achlydophylla Greene, Pittonia V: 87. (1902).

Turtle Mountains: St. John, Dunsieith.

734. *Crocion Nuttallii* (Pursh) Nwd. & Lll.

Viola Nuttallii Pursh, Fl. Am. Sept. 174. (1814).

Leeds, Butte, Minot.

735. *Crocion vallicola* (A. Nels.) Nwd. & Lll.

Viola vallicola A. Nels. Bull. Torr. Bot. Club. 26: 128. (1899).

Leeds, Peninsula of Lake Ibsen, Butte, Minot.

LOPHION Spach, Hist. Nat. Veg. V: 516. (1836).

736. *Lophion Rydbergii* (Greene) Nwd. & Lll.

Viola Rydbergii Greene, Pittonia, Vol. V: 27. (1902).

Devils Lake, Peninsula of Lake Ibsen, Minot, Turtle Mountains.

737 *Lophion aduncum* (J. E. Smith) Nwd. & Lll.

Viola adunca J. E. Smith; Rées' Cycl. 37. no. 63. (1817).

Butte, Leeds; Kulm (Brenckle); Renville Co.: Tolley (O. A. Stevens).

738. *Lophion aduncum* var. *glabrum* (Brainerd) Nwd. & Lll.

Viola adunca var. *glabra* Brainerd, Rhodora Vol. 15: 109. (1913).

Peninsula of Lake Ibsen Leeds; Dickinson (Cl. Waldron), Medora (C. Waldron).

739. *Lophion anisopetalum* (Greene) Nwd. & Lll.

Viola anisopetala Greene, Leaflets Vol. II. :97. (1910).

Leeds, Butte.

Family 85. **LOASACEAE** Reichenb. Consp. 160. (1828).

NUTTALLIA Raf. Am. Month. Mag. 175. (1818).

Nuttallia Bart. Fl. N. A. 274, pl. 62. (1822) = *Callirhoe* Nutt. Jr. Acad. Phil. 2:181. (1821).

Nuttallia DC.; Raf. Jard. Genev. 44. (1821) = *Nemopanthes*.

Nuttallia Spreng. Neue Entdeck. II: 158. (1821); also the Rosaceous *Nuttallia* T. & G. (1840), antedated all the more.

740. *Nuttallia decapetala* (Pursh) Greene, Leaflets I: 210. (1906).

Bartonia decapetala Pursh, in Curtis's Bot. Mag. 18: pl. 1487. (1812).

Bartonia ornata Pursh, in Fl. Am. Sept. 327. (1814).

Mentzelia ornata T. & G., Fl. N. Am. I: 534. (1840).

Touteria decapetala Rydb. Bull. Torr. Bot. Club 30: 276. (1903).

Banks of the Missouri, acc. to the Manuals. Medora (Brenckle).

Family 86. **CACTACEAE** Lindl. Nat. Syst. ed. 2:53. (1836).

CORYPHANTHA (Engelm.) Lemaire, Cact. 32. (1808).

The type of *Cactus* is *Melocactus*. Linnaeus took what was known as *Melocactus* for type, and put in *Pereskia*, *Opuntia* and *Cereus*, and called the whole aggregate *Cactus*.

Mamillaria Haw. Syn. Plant. Succ. 177. (1812). Not Stackh. (1809).

741. **Corpyhantha vivipara** (Nutt.) Britton & Rose, in Britt. & Britt. Ill. Fl. N. A. ed. II: 571. (1913).

Cactus viviparus Nutt. Fraser, Cat. no. 22. (1813). *Mamillaria vivipara* (Nutt.) Haw. Syn. Plant. Succ. Suppl. 82.

Butte (rare) Pleasant Lake, Dunseith.

TUNAS (or **Tune**) Dodonaeus, in Theophrasti Eresii de Historia Plantarum libri decem. Comment. Johannes Bodaeus A. Stapel (1644).

Tuna Dill. Hort. Eth. 396. (1732).

Opuntia Plinius considered to be the banian tree of India, "qui radices ex foliis emittit." It could not be a cactaceous plant, such not having been known before the discovery of America. (Vide Nwd. Am. Midl. Nat. Vol. I: 79 and 80. 1909).

Opuntia Mill. Gard. Dict. ed. 7. (1759).

742. **Tunas fragilis** (Nutt.) Nwd. & Lll.

Cactus fragilis Nutt. Gen. Pl. I: 296. (1818).

Opuntia fragilis (Nutt.) Haw, Syn. Pl. Succ. Suppl. 82. (1819).

McHenry Co.: Sand Hills.

743. **Tunas polyacantha** (Haw) Nwd. & Lll.

Opuntia polyacantha Haw., Syn. Pl. Succ. Suppl. 82. (1819).

Cactus ferox Nutt. Gen. Pl. I: 296. (1818). Not Willd. (1813).

Opuntia missouriensis DC. Prodr. 3: 472. (1836).

Minot.

Family 87. **ELAEAGNACEAE** Lindl. Nat. Syst. ed. 2: 194. (1836).

ELAEAGNUS Tour. Cor. 53. (1703).

744. **Elaeagnus argentea** Pursh, Fl. Am. Sept. 114. (1814).

Leeds, Butte, Pleasant Lake, Dunsieith.

745. *Elaeagnus angustifolia* Blanco, Fl. Philip I: 24.
Kulm. (Brenckle).

LEPARGYREA Raf. Am. Month. Mag. 176. (1818).

746. *Lepargyrea canadensis* (Linn.) Greene, Pittonia 2: 122. (1890).

Shepherdia canadensis (Linn.) Nutt. Gen. Pl. 2: 240. (1818).

Hippophae canadensis Linn. Sp. Pl. 1024. (1753).

Turtle Mountains.

747. *Lepargyrea argentea* (Pursh) Greene, Pittonia 2: 122. (1890).

Hippophae argentea Pursh., Fl. Am. Sept. 115. (1814).

Shepherdia argentea (Pursh) Nutt. Gen. Pl. 2: 240. (1818).

Des Lacs (Ward Co.).

Family 88. **SALICARIAE** Adanson (1763), also Jussieu, Gen. 330. (1789).

Lythrarieae DC. Prodr. III.: 75. (1828). *Lythraceae* Lindl. Nat. Syst. ed. 2: 100. (1836).

SALICARIA Tournefort, Éléms. (1694). Sic nuncupata, "quia in *Salicetis* passim reperitur. Estne aliquid magis ridiculi?" —Bubani, Fl. Pyr. II: 640. (1890). *Ans.*: Yes, I believe that we keep quite many names more ridiculous than this.

Chabraea Bubani, l. c. Adanson in Fam. Pl. 2: 234. (1763) applies it to *Peplis* alone. *Chabraea* DC. Am. Mus. Par. 65. (1812), is *Lasiorrhiza* Lagasc. (*Compositae*). *Lythrum et Peplis* Linn. et auctores. *Lythrum* Diosc. = *Lysimachia*.

748. **Salicaria alata** (Pursh) Lunell.

Lythrum alatum Pursh, Fl. Am. Sept. 334. (1814).

Richland Co. acc. to Bergman. From Red River Valley has also been reported *Lythrum dakotianum* Nwd. in Am. Midl. Nat. Vol. III.: 266. (1914), Sioux Falls, S. Dak. So far, the writer has had no occasion to compare them.

Family 89. **GEMINACEAE** Dulac, Flor. Dept. Haut. Pyr. 329. (1867). For family characters see Am. Midl. Nat. Vol. III.: 183. (1913).

REGMUS Dulac. Pl. Pyr. 328. (1867).

Circaea Lobel., Tourn. Linn. Gen. Pl. 24. (1754), et auctorum veterum. *Circaea* Diosc. 3: 124. Plinius, Nat. Hist. 27.8 vel 38 = *Capsicum annuum* R. Br. Congo, 42, vel *Circaea lutetiana* Lobelius, Broterus, *Vincetoxicum nigrum* Sprengelius, Hist. R. Hrb. 163,

vel *Mandragora Circaea*, vel *Solanum nigrum* (!!!) Vide Bubani, Fl. Pyr. II.: 658. (1890).

Carlo-Stephania and *Carlostephania* (!!!) Bubani, l. c.

749. *Regmus alpinus* Dulc. Engl. Bot. v. 15, n. 1057.

Circaea alpina Linn. Sp. Pl. 9. (1753).

Carlostephania minor (Columnae) Bubani, Fl. Pyr. II.: 660. (1890). Column. Ecphr. P. 2, p. 79-80.

Pleasant Lake.

750. *Regmus lutetianus* Dulc. Engl. Bot. v. 15, n. 1056.

Circaea lutetiana Lobel. Obs. et Icon., Linn. Sp. Pl. 9. (1753).

Carlostephania maior (Tragus) Bubani, l. c. 659. Tragus, Lapp. Sylv. Stirp. Hist. p. 843, n. 2.

Pleasant Lake.

Family 90. **ONAGRACEAE** Dumortier, Anal. Fam. 36. (1829).

GAURA Linn. Gen. Pl. 163. (1754). Amoen. Acad. III.: 56. (1756). 1751, also Sp. Pl. 347. (1753).

751. *Gaura parviflora* Dougl.; Hook. Fl. Bor. Am. I: 208. (1830).

In the western part of the State.

752. *Gaura coccinea* Pursh, Fl. Am. Sept. 733. (1814).

Butte, Barton, Rolette; Kulm (Brenckle).

753. *Gaura marginata* Lehm. in Hook. Fl. Bor. Am. I: 208. (1833).

Leeds.

754. *Gaura parvifolia* Torr. Ann. Lyc. N. Y. II: 201. (1828).

Dokken's Pond (Benson Co.), Minot.

USORICUM (οὐς ear, ἰσὺς belonging to a mule, so named because of the fancied resemblance of its leaves to the ears of this animal) Lunell, nom. nov.

Brunyera Bubani, Fl. Pyr. II.: 648. (1890). Not *Bruniera* Franch, in Billotia 25. (1864) = *Wolffia*. *Onagra* Tourn. *Oenothera* Linn. et Auctores. Not. *Oenothera* Theophr. Hist. Pl. 9: 21, nor *Oenothera* vel *Onagra* Diosc. 1: 4. 116. Plinius, Nat. Hist. 26: 11 vel 69. *Onagra* Adanson, Fam. des Plantes 2: 85. (1763).

755. *Usoricum strigosum* (Rydb.) Lunell.

Onagra strigosa Rydb. Mem. N. Y. Bot. Gard. I: 278. (1900).

Leeds, Peninsula of Lake Ibsen, Butte, Dunsieith, St. John.

ANOGRA Spach, Am. Sci. Nat. (II.) 4: 164. (1835).

756. *Anogra albicaulis* (Pursh) Britton, Mem. Torr. Bot. Club 5: 234. (1894).

Oenothera albicaulis Pursh, Fl. Am. Sept. 733. (1814).

Oenothera pinnatifida Nutt. Gen. Pl. I: 245. (1818).

Dickinson (Cl. Waldron).

757. *Anogra pallida* (Lindl.) Britton, Bull. Torr. Bot. Club. 23: 175. (1896).

Oenothera pallida Lindl. Edward's Bot. Reg. 14: pl. 1142. (1828.)

Oenothera pinnatifida integrifolia A. Gray, Mem. Am. Ac., n. ser. 4: 44. (1849).

Leeds, Butte, Pleasant Lake.

PYROGENNEMA (gr. πῦρ fire, γέννημα that which is begotten, so named because the plant appears in the path of the fire on burnt-over clearance land) Lunell, nom. nov.

Chamaenerion Gesner, Hort. Germ. 215. (1561), Adanson, Fam. des Pl. 2: 85. (1763). Means Dwarf Nerium, with the name founded on *Nerium*, and therefore not acceptable.—Gesner quotes that some called *Chamaenerion* "*Antoniana vel Sti Antonii herba.*"

758. *Pyrogennema angustifolium* (Linn.) Lunell.

Chamaenerion angustifolium (Linn.) Scop. Fl. Car. ed. 2: I: 271. (1772).

Epilobium angustifolium Linn. Sp. Pl. 347. (1753).

Leeds, Butte,.

759. *Pyrogennema angustifolium* var. *abbreviatum* Lunell.

Chamaenerion angustifolium var. *abbreviatum* Lunell, Bull. Leeds Herb. no. 2, p. 7. (1908).

Leeds, Devils Lake.

EPILOBIUM Gesner, Hort. Germ. 215. (1561). "*Epilobia* tecto sole, generatim, omnia cum corollis clausis offendens, quae cito aperiuntur, dum sol se ostendit, etiam si illas directe non tangat."—*Bubani*, Fl. Pyr. II: 650. (1890).—*Epilobium* so called "Appelletur igitur si libet *Epilobium*, Ἐπιλόβιον, vocabulo ex tribus composito; quorum ἴον (id est viola seu flos eius quem Leucoio similem habet); ἐπὶ λόβον, id est super siliqua nascitur etc." Britton says in his flora: "(Greek, upon a pod, flower and pod appearing together.)" He possibly presumes λόβιον diminutive of λόβος. Whereas it means a violet on a pod."

760. *Epilobium densum* Raf.

Butte, Pleasant Lake, Towner: Dickey Co. (Brenckle).

761. *Epilobium adenocladon* (Hausskn.) Rydb. Bull. Torr. Bot. Club 33: 146. (1906).

Epilobium paniculatum adenocladon Hausskn. Monog. Epilob. 247. (1884).

Leeds, Des Lacs.

762. *Epilobium adenocaulon* Hausskn. Oesterr. Bot. Zeitschr. 29: 119. (1877).

Leeds, Butte.

763. *Epilobium adenocaulon* var. *pseudocoloratum* Lunell, in Am. Midl. Nat. Vol. III.: 142. (1913).

Pleasant Lake.

MERIOLIX Raf. Am. Month. Mag. 192. (1819).

764. *Meriolix serrulata* (Nutt.) Walp. Repert. Bot. 2: 79. (1843).

Oenothera serrulata Nutt. Gen. Pl. I: 246. (1818).

Leeds, Butte, Dunsieith.

PACHYLOPHUS Spach, Hist. Veg. 4: 365. (1835).

765. *Pachylophus caespitosus* (Nutt.) Raimann, Eng. & Prantl., Nat. Pfl. Fam. 37: 215. (1893).

Oenothera caespitosa Nutt. Fras. Cat. (1913).

Dickinson (Cl. Waldron).

LAVAUXIA Spach, Hist. Veg. 4: 366. (1835).

766. *Lavauxia flava* A. Nels. Bull. Torr. Bot. Club 31: 243. (1904).

Dickinson (Cl. Waldron).

Family 91. **HALORAGIDACEAE** Kl. and Gareke, Bot. Erg. Wald. 151. (1852).

LIMNOPEUCE Cord. Hist. 102. (1561). Vaill. Haller., Ludw. Scopoli, Adans. *Hippuris* Linn. Gen. 11.

767. *Limnopeuce vulgaris* Ruell, Nat. Stirp. 3: 79. Matth. 433. (1554). Scop. Fl. Carn. ed. 2.

Hippuris vulgaris Linn. Sp. Pl. 4. (1753).

Butte, Oberon.

MYRIOPHYLLUM Diosc., Vaill., Pontedera, Linn. Gen. n. 1066.

768. *Myriophyllum spicatum* Diosc. 4: 113. Linn. Sp. Pl. 992. (1753).

Leeds.

799. *Myriophyllum scabratum* Michx. Fl. Bor. Am. 2: 190. (1803).

Potamogeton pinnatum Walt. Fl. Car. 90. (1788); possibly.
Myriophyllum pinnatum (Walt.) B. S. P. Prel. Cat. N. Y. 16.
 (1888), at least in part.

Kulm (Brenckle).

Family 92. **ARALIACEAE** Vent. Tabl. 3: 2. (1799).

ARALIA Tour. Éléments 249. (1694). *Aralia canadensis*
 Tour. l. c. = *A. racemosa* Linn.!! and an older binary!

770. *Aralia nudicaulis* Linn. Sp. Pl. 274. (1753).

Devil's Lake, Turtle Mountains.

Family 93. **UMBELLIFERAE** B. Juss. Hort. Trianon (1759).

SANICULA Brunfels, Herb. Vic. Ic. I: 81 a b (1531). Tour
 Linn. Gen. n. 326.

771. *Sanicula marilandica* Linn. Sp. Pl. 235. (1753).

Pleasant Lake, Devils Lake, Turtle Mountains.

WASHINGTONIA Raf. Am. Month. Mag. 2: 176. (1818).

It appears out of reason to dedicate to our presidents names
 indicative of scientific achievements. Honorary names like
Washingtonia and *Jeffersonia* ought to be reserved for botanists.

Osmorrhiza Raf., l. c. (1818).

772. *Washingtonia longistylis* (Torr.) Britton in Britt. &
 Br. Ill. Fl. 2: 530. (1897).

Myrrhis longistylis Torr. Fl. North. & Mid. U. S. 310. (1824).

Osmorrhiza longistylis DC. Prodr. 4: 232. (1830).

Peninsula of Lake Ibsen, Devils Lake.

COGSWELLIA Raf. Schult. in Roem. & Schult. Syst. 6,
 p. XLVIII. (1820).

773. *Cogswellia daucifolia* M. E. Jones, Contrib. West.
 Bot. XII: 34. (1908).

Kulm (Brenckle).

774. *Cogswellia foeniculacea* (Nutt.) C & R. Contrib.
 U. S. Nat. Herb. XII: 450. (1909).

Ferula foeniculacca Nutt. Gen. I: 183. (1818).

Peucedanum foeniculaceum Nutt.; T. & G. Fl. N. Am. I: 627.
 (1840).

Dunsieth.

775. *Cogswellia villosa* (Nutt.) Schult. in Roem. & Schult
 Syst. 6, p. XLVIII. (1820). There is also a *C. villosa* M. E. Jones,
 Contr. W. Bot. XII: 34. (1908) which is a (?) (!) = *Lomatium*
villosum.

Peucedanum villosum Nutt.; S. Wats. Bot. King's Exp. 131. (1871).

Williston.

776. *Cogswellia orientalis* (Coult. & Rose) Jones, Contr. West. Bot. XII: 33. (1908).

Lomatium orientale Coult. & Rose, Contr. U. S. Nat. Herb. 7: 220. (1900).

Leeds, Butte, Towner, Dunsieith.

SPHONDYLIIUM Diosc. 3: 90. Plinius 12: 20, 146. Scribon Larg. 2: 5 = *Heraclum Sphondylium* Linn. This is *Panaces Heraclaeon* of Theoph. Hist. 9: 9. [Linn. Gen. n. 337.]

777. *Sphondylium lanatum* (Michx.) Nwd. & Lll.

Heraclum lanatum Michx. Fl. Bor. Am. I: 166. (1803).

Peninsula of Lake Ibsen, Pleasant Lake, Turtle Mountains.

CYMOPTERUS Raf. Journ. Phys. 89: 100. (1819).

778. *Cymopterus acaulis* (Pursh) Rydb. Bot. Surv. Neb. 3: 38. (1894).

Selinum acaule Pursh, Fl. Am. Sept. 732. (1814).

Cymopterus glomeratus Raf. Journ. Phys. 89: 100. (1819).

Pleasant Lake, Denbigh, Williston.

PETROSELINUM Dioscorides 3: 70.

779. *Petroselinum sativum* Hoffm. Gen. Umb. 177. (1814).

Apium Petroselinum Linn. Sp. Pl. 264. (1753).

Leeds.

KAROS Diosc. 3: 59. *Careum* Colum. 12: 51, 1.

780. *Karos Carvi* (Linn.) Nwd. & Lll.

Carum Carvi Linn. Sp. Pl. 263. (1753).

Barton, St. John.

ANETHUM Dioscorides 3: 60 and 67. Colum. 11: 3, 20: 120.

781. *Anethum benevolens* Virgilius, Narcissum, et florem jungit benevolentis anethi. *Ecl.* 2: 48. Et vetus adstricti farcis pendeat anethi. *Mor.* 59. Theocr. Idyll. XIV: 119. Moschus Idyll III.: 107.

Anethum graveolens Linn.

Leeds.

MUSINEON Raf. Journ. Phys. 91: 71. (1820).

782. *Musineon divaricatum* (Pursh) Nutt.; T. & G. Fl. N. m. I: 642. (1840).

Seseli divaricatum Pursh, Fl. Am. Sept. 732. (1814).

Adorium divaricatum (Pursh) Rydb. Bot. Surv. Neb. 3: 37. (1894).

Kulm (Brenckle).

CICUTA Gesner. Valcird & Amot. Diosc. 68. (1561). Linn. Gen. n. 354.

783. *Cicuta dakotica* Greene, Leaflets Vol. II: 237. (1912).

Footstock short with slender roots above and a fascicle below of thick and elongated-fusiform roots, 10-15 cm. long, 1 cm. wide at the top. In young plants all the roots are almost in one level.

Peninsula of Lake Ibsen, Leeds, Thorne, Turtle Mountains.

784. *Cicuta dakotica* var. *pseudomaculata* Lunell, var. nov.

Roots tuberiform, 3-4 cm. long and 1 cm. wide, resembling those of *C. maculata* Linn.

Found along Mouse River at Towner.

785. *Cicuta dakotica* var. *pseudovirosa* Lunell, var. nov.

Roots very numerous, all slender, almost fibrous, like the root-system of *C. virosa* Linn. of the Old World.

In mud. Towner.

SIUM Diosc. 2: 153. Linn. Gen. n. 348.

786. *Sium cicutaefolium* Gmel. Syst. 2: 482. (1791).

Sium lineare Michx. Fl. Bor. Am. I: 167. (1803).

Leeds; Kulm (Brenckle). And everywhere.

PASTINACA Dod., Pempt. 680. (1582), Bauhin Hist. 3: 149. (1651). Tour. Linn. Gen. n. 362.

787. *Pastinaca sativa* Linn. Sp. Pl. 262. (1753), acc to Daub. = *Sisaron* Diosc. 2: 139, acc. to Fraas = *Elaphoboscon* Diosc. 3: 80. Plin. 22: 22, also C. Bauhin. Even Anguillara who knew more of the ancient plants than any man of his time or most since, says: (Semplici 1561, p. 131): "Quanto allo Elaphobisco non ho pianta alcuna, che si confaccia alla sua descretione; anche vene siano alcune, pianto corrispondere al detto de gli antichi. Ho benve duto in molte parti d'Italia alcune sorti di Pastinache, che si sogliano mangiare in Padova la quadriagesima, enascono fuori alla campagna corrispondere in ogni cosa alla descretione sua, exeetto che le radici sono lunghe fuori dell ordine scuitto," etc.

Bubani attributes *Pastinaca* to Plinius 19: 5 or 28 (wide 2: 293). Leeds, Butte.

ZIZIA Koch. Nov. Act. Caes. Leop. Acad. 12: 129. (1825).

788. *Zizia aurea* (Linn.) Koch. l. c.

Smyrniium aureum Linn. Sp. Pl. 262. (1753).

Towner, Turtle Mountains, Jamestown.

789. *Zizia cordata* (Walt.) DC. Prodr. 4: 100. (1830).

Smyrnium cordatum Walt. Fl. Car. 114. (1788).

Leeds, Butte; Kulm (Brenckle). And everywhere.

Family 94. **CORNACEAE** Link, Handb. 2: 2. (1831).

OSSEA Lonicer (probably in all earlier editions, even 1557?),

Ed. Uffendal, p. 121. (1703), and Ed. Ehrhart-Uffendal 121. (1783).

Svida Opiz Sesnam. 94. (1852).

Type of *Cornus* Virg. = *Cornus mas*. Theophrastus and Greek authors called it *Krancia* and *Krania*. Theophrastus called *Cornus sanguinea* **Thelykraneia**!! Hist. Plant. III.: 6 ex Stapelii Ed. Comment. Theophr. (1644).

790. *Ossea instolonea* (A. Nels.) Nwd. & Lll.

Cornus instolonea A. Nels. Bot. Gaz. 53: 224. (1912). *Svida stolonifera riparia* Rydb. Bull Torr. Bot. Club. 31: 573. (1904).

Turtle Mountains, Towner, Minot. Des Lacs.

MESOMORA Rudbeck, O., Fl. Lapp. Illustr. Act. Lit. Suec. p. 98. (1720).

Chamaepericlymenum Tragus. Hill (1756). Undesirable, sesquipedalian name.

Cornella Rydb., Fl. of Colorado 249. (1906).

Mesomora canadensis (Linn.) Nwd. in Am. Mid. Nat. vol. I: 19. (1909.)

Cornus canadensis Linn. Sp. Pl. 117. (1753).

Rolette Co.: Rolla (L. R. Waldron).

OUR BIRDS IN THE SPRING OF 1914

BY BROTHER ALPHONSUS, C. S. C.

The March records for 1914 totalled 30, 7 more than those of 1913. Species not seen in 1913 were: Red-headed Woodpecker, Hairy Woodpecker, Cardinal, White-breasted Nuthatch, Chickadee, Snowflake, Sparrow Hawk. Species not found in 1914 were: Northern Shrike and Brown Creeper.

The Crow was well distributed throughout March, 1914, the longest absence being 2 days. Compared with 1913, March of this year had 5 more records; the totals of the two months being res-

pectively 26 and 21 records. On March 14 a Crow was seen flying with food from a chicken yard—doubtless to feed its young.

The Blue Jay had an unusually large number of records for March—25. In the same month, for the two previous years, there was a total of only 19 records. The Jay's longest absence in March of this year was one day. On March 3, this species was plentiful in an oak grove near a small lake.

The Red-headed Woodpecker's records for March equalled those of the Crow—26. In previous years, this species was found only once, on March 18, 1911. On March 10, 1914, a loud calling note of the Red-head was first heard; on the 18th, the characteristic *ki yu, ki yu* note was first uttered.

The Downy Woodpecker had almost the same number of records for March 1914 as it had for the same month in 1913—11 for the former and 10 for the latter. In 1912 there was but one record of this species in March. The longest absence this year was 8 days.

The Song Sparrow exceeded its March records of 1913 by 4 in 1914, the latter having 21 and the former 17 records. The longest absence of the species in 1914 was 4 days. The first feeble note of the Song Sparrow was heard on March 5; on the 10th, the bird sang louder; on the 16th, it was in full song.

The Tree Sparrow was much more plentiful in March 1914 than in 1913, the totals for the two months being 22 and 10 records respectively. Three days was the longest absence for the species this year in March. In this month Tree Sparrows were often seen in both morning and afternoon. They show a preference for orchards and gardens, when they feed on the ground and sing their exceedingly sweet notes in the trees. I noted a call-note like one of the Goldfinch's.

The Meadowlark had more records this year in March than either of the two previous years—13. In 1913, there were only 5 records; in 1912, 9. The longest time absent was 9 days—before the 10th, when the species first arrived. By March 16, larks began to increase notably, as was evidenced by their singing in many places.

The Robin came this year on the 13th, and was seen every day afterwards in March. In 1913, there were 22 records for March, with an absence of 8 days before the time of arrival, and one day after the arrival.

In March, the Bluebird had 16 records, in 1914, and 14, in 1913. In 1914 the longest absence was 12 days; in 1913, 10 days—both before the bird's arrival. After March 25, 1914, the Bluebird's note was heard continuously.

The Red-winged Blackbird, in March, had 7 records in 1914; 3, in 1913; and none in 1912. In 1914, the species was first recorded on the 24th of March, and was absent only one day during the rest of the month. On the day of its arrival two common notes of the Red-wing were heard.

The Bronzed Grackle was present 18 days in March, 1914, and 19 days in the same month in 1913. In the former year the species arrived on the 14th, and was not absent after that date; in 1913, the time of migration was March 12, with one day afterward when no record was made.

The White-breasted Nuthatch was rare in March, 1914, there being only 7 records for the month. In March 1913, there were 8 records; in 1912, none. The intervals of absence in 1914 occurred frequently throughout the month, the longest being between the 10th and the 20th. In March, 1913, the species was not recorded until the 10th, and was absent often for short periods until the end of the month.

The Snowbird was recorded 21 times in March 1914; 15 times in March, 1913. In 1914, the species was absent between the 6th and the 13th, with a number of shorter periods when no records were made. In March, 1913, the Snowbird disappeared until the 11th, which was the longest time of absence during the month.

In three years, 1912-1914, the Kildeer had in March 17 records—in 1912, 1; in 1913, 6; in 1914, 10. The longest absence in March 1914 was 9 days—before the date of arrival on the 10th of the month. The same disparity in the distribution of this species is also shown by my earlier records, the present year having the highest number ever made for March.

The Goldfinch and Purple Finch had few records in March, the former 8 and the latter 6. These are the only March records ever obtained for the Purple Finch. The Goldfinch had 2 March records in 1912, but none in the other years covering my observations.

The rare species seen in March were: Hairy Woodpecker, Kingfisher, Mourning Dove, Cowbird, Chicadee, Sparrow Hawk,

Herring Gull, Canada Geese, Screech Owl, Phoebe, Sapsucker, and Golden-crowned Kinglet.

April, 1914 totalled 55 species, the highest record ever made by the writer. In 1913, April had 50 species, which is about a normal number for that month. In 1910, there were 36 species, in 1912, 40—which shows how the results of different years may vary.

The Vesper Sparrow was recorded on 14 days in April, 1914, as against 19 days for the same month in 1913. The longest period of absence in 1914 was 10 days—between the 2nd and the 13th; in 1913, the greatest interval between any of the April records was 3 days. The fact that this species is in song from the date of its arrival makes the observer certain that his records are reliable.

The Field Sparrow had fewer records this year in April than for the past two years—19. In 1913, there were 26; in 1912, 24. The longest absence in April, in three years, also occurred in 1914, owing to the late arrival of the bird on the 7th of the month. By the 16th, Field Sparrows were plentiful in woods, and in full song.

The Tree Sparrow had its usual number of records for April—10, falling just one below those of 1912, and exceeding those of 1913 by 6. The longest absence was 10 days—after the 20th of the month, when the species departed.—On April 7, many Tree Sparrows were singing in a swampy place.

The Chipping Sparrow's record for April 1914 and 1913 were equal—13. In 1912 this species had 22 records. The dates of arrival in 1913 and 1914 were also indential—the 15th, whereas in 1912 this sparrow was first found on the 2nd of April. In that year the bird was recorded daily after the 10th of April.

The Purple Finch had no records in 1910, 1912, 1913; 6, in 1911; 8, in 1914; or 14 records in five years. In 1914, this species remained until April 17, the longest absence in that month before that date being these days.—April 1. Purple Finches were feeding on seeds of sycamore trees. Their notes—low and sweet—were heard both morning and afternoon. They were plentiful in a grove of elms and maples.—April 17, 4 p. m.—Last record of the Purple Finch, in trees near a small lake.

The Sapsucker's April records for 1914 exceeded those of 1913 by but one. The longest absence before the date of departure—April 25—was 3 days. This period of absence was identical

with that of the preceding April, but the time of departure was 2 days earlier.—By April 9, 1914, Sapsuckers were plentiful.

The Golden Crowned Kinglet was recorded on 13 days in April, 1914 and on 6 days the April before. The date of leaving in 1914 was April 22, and the longest absence before that was from the 1st to the 6th of the month.—April 14, 1914.—Golden-crowned Kinglets in oak trees. Both species of Kinglets show a preference for these trees.

The Ruby-crowned Kinglet was observed on 5 days in April 1914, and on 9 days in April 1913. There was a long interval of absence from the 1st to the 17th of April, 1914; and from the 1st to the 16th in 1913—both before the species arrived.—Ruby-crowns may be distinguished from Golden-crown by their flitting less quickly.

In the Phoebe we have a species that show great irregularity in its distribution between April 1912 and April 1913 and 1914, the first year having but 2 records and the other two together, 30 records. Five days was the longest absence in April, 1914—before the 6th of the month.—April 25, 1914.—A Phoebe building in a grotto.

The Towhee shows similarity in its records for April 1914 and 1913, the former having 11 and the latter 15 records. Six days absent in April 1914, and 5 in 1913, were the longest intervals for this species.

The few April records of the Hermit Thrush for the years 1912, 1913, 1914, indicate that this species may not appear frequently in this month. It is remarkable that the total number of records for April, 1911 exceeded the total of the three following Aprils, which had only 12 records.

The Brown Thrasher is a species that is quite regular in its April records. For three years—1912, 1913, 1914 there were respectively 12, 16 and 14 records. The longest absence in 1914 was before the date of arrival on April 10th..

The Barn Swallow always appears in April, but the few records of the last three years—which together totalled only 14—show that the species is not plentiful in this month, or that the observer must resort to the vicinity of barns to find this swallow regularly.

The Myrtle Warbler is the only one of this family that arrives early enough in April to be counted among the species that are

not rare in that month. For the past two years, April had 10 records in 1914 and 11 in 1913. It is remarkable that in both years the Myrtle Warbler arrived on the 18th of April.

The rare species in April were: Spotted Sandpiper—6 records; Yellow Palm Warbler, Brown Creeper, Baltimore Oriole—5 records; Catbird, Warbling Vireo, Yellow Warbler, House Wren—4 records; Kingbird, Fox Sparrow, Loggerhead Shrike, White-crowned Sparrow—2 records; Pine Grosbeak, Cardinal, Acadian Flycatcher, Canada Geese, Herring Gull, White Breasted Nuthatch, Wilson Snipe, Orchard Oriole, Chimney Swift, Black-throated Green Warbler—1 record.

The month of May 1914 had 11 species fewer than the same month in 1913, which totalled 85 species. These figures indicate that a normal record for May will be between 75 and 85 species. Certain species that are very rare may not be recorded in one year, thus reducing the total considerably.

There is a notable difference in May between the records of the White-throated and White-crowned Sparrows. In 1913, the former had 8 records; in 1914, 15 records; in 1913, the latter had 6 records; in 1914, 2 records. The Whitethroat's longest absence was after the 23rd, when the bird departed.

The May records of the Bluebird show great disparity for the years 1913 and 1914—8 for the first and 17 for the last. The writer often wondered why he has recorded this species so seldom in certain months; and he has concluded that its rather retiring habits, especially in the nesting season, must be the reason why the bird is not seen often.

The Kingfisher had few records for May in both 1913 and 1914, the two years totalling only 15 records. In 1914, there were 9 records, with the longest absence 8 days. A person passing near small lakes—as the writer does twice daily—would expect to see or hear Kingfishers regularly. I think the true explanation is that unless the species nests near a body of water it will not be found there frequently.

Another species showing some rarity is the Phoebe, for in two years it had but 20 records in May. I pass a certain grotto frequently during the nesting season, and yet seldom hear or see the bird off the nest.—A comparison with its cousin the Wood Pewee, shows the latter to be much more common. The same two years gave the Pewee 36 records.

The Hermit Thrush shows differences both in distribution and in intervals of absence for May in 1913 and 1914. There were 23 records for the first year and 11 for the second. In May 1914, a long absence occurred from the 1st to the 11th, which is unaccountable in a species that is usually so common in this month. This statement can be verified by the fact that the Hermit Thrush never failed to appear for longer than 2 days during the previous May.

The Towhee shows disparity in its records for the year 1913 and 1914—15 for the former and 8 for the latter. A plausible explanation of the infrequent appearance of this species before retiring into secluded woodlands to nest is hard to find, or why in one season there may be such a marked difference in the records from another.

The Crested Flycatcher is usually recorded most frequently in May, when the bird seems to wander about a good deal, visiting orchards and open woods in search of a suitable nesting place. Holes in apple trees are sometimes selected by this species for its nest. The two years of 1913 and 1914 show a difference of 5 records for May, the latter year having a total of 20.

The Cedarbird is another wandering species that is recorded most frequently in summer, when the cherries and mulberries attract these birds in numbers. In May, 1913 had 6 records and 1914, 8 records. It would be interesting to know what this species feeds on before the berries begin to grow.

In May 1914, the writer found 15 warblers, which were fewer than the number seen in other years. Those recorded most frequently were the Yellow Warbler, the Myrtle Warbler and the Yellow Palm Warbler. The Yellow Warbler had 12 records for 1914 and 18 for 1913; the Myrtle Warbler had 16 records for 1914 and 11 for 1913. An earlier date of departure in one year made the difference in the Myrtle Warbler's records.

Some rare species seen in May 1914 were: Bobolink—4 records; Ovenbird and Connecticut Warbler—3 records; Wood Thrush, Ruby-crowned Kinglet, Scarlet Tanager, Blue-headed Vireo, Greater Yellowlegs, Purple Martin, Tennessee, Magnolia, Black and White Warblers—2 records; Red-breasted Nuthatch, Savanna Sparrow, Bobwhite, Hummingbird, Pine and Black-burian Warblers—one record.

MARCH.

- Crow, 2, 3, 4 to 12, 14 to 17, 19 to 28, 31.
 Blue Jay, 2, 3, 4, 6 to 11, 13, 15, 16, 17 to 24, 26 to 29, 31.
 Red-headed Woodpecker, 2, 3, 4 to 6, 8 to 13, 15 to 17, 19 to 24, 26 to 31.
 Downy Woodpecker, 4, 5, 10, 15, 19, 28 to 31.
 Hairy Woodpecker, 5.
 Goldfinch, 4, 9, 21, 23, 24, 28, 30, 31.
 Song Sparrow, 5, 9, 10, 13 to 16, 18 to 31.
 Tree Sparrow, 2, 4 to 10, 13 to 16, 20 to 28.
 Cardinal, 11.
 Meadowlark, 10, 11, 16, 21, 23 to 31.
 Robin, 13 to 31.
 Bluebird, 13, 15, 16, 18 to 26, 28 to 31.
 Kingfisher, 27.
- Mourning Dove, 30.
 Cowbird, 31.
 Red-winged Blackbird, 24 to 28, 30, 31.
 Bronzed Grackle, 14 to 31.
 White-breasted Nuthatch, 2, 4, 5, 10, 20, 23, 24.
 Chickadee, 1, 3, 4, 9, 31.
 Snowbird, 1, 2, 3, 6, 13, 14, 15, 17, 20 to 31.
 Snowflake, 4.
 Sparrow Hawk, 4.
 Killdeer, 10, 15, 19, 23, 24, 26, 28 to 31.
 Herring Gull, 16, 24.
 Canada Geese, 14, 23.
 Screech Owl, 3.
 Sapsucker, 25.
 Phoebe, 31.
 Golden-crowned Kinglet, 28.
 Purple Finch, 11, 23, 24, 28, 30, 31.

Total number of species seen, 30.

APRIL.

- Crow, 1, 2, 5, 13 to 17, 19 to 22, 24, 25, 27, 29.
 Blue Jay, 1 to 21, 23, 25 to 30.
 Red-headed Woodpecker, 1, 2, 4, 5, 6, 8 to 30.
 Downy Woodpecker, 4, 13, 14, 16, 18, 24.
 Goldfinch, 1, 2, 4, 7, 9, 14, 16, 24 to 27.
 Song Sparrow, 1 to 30.
 Vesper Sparrow, 2, 13 to 18, 22 to 25, 27, 28, 29.
 Fox Sparrow, 7, 15.
- Field Sparrow, 7, 11 to 19, 21 to 25, 27 to 30.
 Tree Sparrow, 4, 7, 9, 10, 12, 13, 14, 16, 17, 20.
 Chipping Sparrow, 15, 16, 18, 21 to 30.
 White-throated Sparrow, 28, 29.
 Cardinal, 7.
 Meadowlark, 1 to 7, 9, 11 to 29.
 Robin, 1 to 30.
 Bluebird, 1, 2, 4 to 7, 9, 12 to 22, 24, 25.
 Chickadee, 5, 14, 16, 19.

- Snowbird, 1 to 23, 25, 26, 27.
 Brown Creeper, 20 to 25.
 Pine Grosbeak, 18.
 Killdeer, 1 to 5, 12 to 17, 20,
 22 to 26.
 Purple Finch, 1, 2, 4, 5, 7, 11,
 13, 17.
 Canada Geese, 4.
 Bronzed Grackle, 1 to 21, 23
 to 30.
 Cowbird, 2, 5, 7, 11 to 30.
 Red-winged Blackbird, 1 to 7,
 10 to 15, 17 to 26, 28, 29.
 Herring Gull, 3.
 Sapsucker, 4, 6 to 14, 16, 18,
 20, 22, 25.
 White-breasted Nuthatch, 14.
 Kingfisher, 1, 3, 4, 6 to 9, 11, 15,
 19, 21, 25, 26, 28, 29, 30.
 Golden-crowned Kinglet, 6, 7,
 9, 11, 12, 14, 16 to 22.
 Ruby-crowned Kinglet, 17, 22,
 24, 25, 26.
 Mourning Dove, 1, 4, 7, 9, 13 to
 26, 28, 29.
 Phoebe, 6, 7, 11, 12, 13, 15 to
 18, 25, 26.
 Towhee, 7, 9, 12 to 16, 21, 24,
 27, 30.
 Total number of species seen, 55.

MAY.

- Crow, 2, 5, 6, 8, 9, 11, 13, 15,
 16, 19, 22, 23, 25, 30.
 Blue Jay, 1 to 6, 9, 10, 11, 14,
 to 19, 21, 22, 26, 28, 29.
 Red-headed Woodpecker, 1 to
 23, 25 to 31.
 Downy Woodpecker, 2, 3, 6,
 15, 22.
 Loggerhead Shrike, 7, 8.
 Flicker, 12 to 29.
 Hermit Thrush, 9, 13, 17, 18,
 22, 24.
 Brown Thrasher, 16 to 20, 22
 to 30.
 Catbird, 26, 27, 28, 30.
 Wilson Snipe, 14.
 Tree Swallow, 21, 22.
 Barn Swallow, 22, 23, 25, 27,
 28, 29.
 Spotted Sandpiper, 25, 26, 27,
 28, 29.
 Baltimore Oriole, 25 to 30.
 Warbling Vireo, 26 to 29.
 Orchard Oriole, 28.
 House Wren, 26, 28, 29, 30.
 Chimney Swift, 26.
 Kingbird, 28, 29.
 Acadian Flycatcher, 28.
 Myrtle Warbler, 18, 19, 20, 22,
 25, 26 to 30.
 Yellow Palm Warbler, 25 to 30.
 Black-throated Green Warbler
 25.
 Yellow Warbler, 27 to 30.
 Total number of species seen,
 55.
 Red-breasted Nuthatch, 11.
 Goldfinch, 2, 4, 5, 6, 8 to 27,
 29, 30.
 Song Sparrow, 1 to 31.
 Vesper Sparrow, 1 to 6, 8 to 11,
 13 to 20, 22, 23, 24, 27, 29,
 30, 31.
 White-crowned Sparrow, 6, 14.

- White-throated Sparrow, 2, 4, 5, 6, 8, 9, 11 to 18, 23.
 Field Sparrow, 1 to 7, 9 to 15, 18, 19, 21 to 23, 25, 26, 28, 29, 30.
 Chipping Sparrow, 1 to 6, 8 to 11, 13 to 16, 18 to 26, 28 to 31.
 Savanna Sparrow, 2.
 Meadowlark, 1 to 6, 8 to 15, 18 to 31.
 Robin, 1 to 31.
 Bluebird, 2, 3, 6, 8, 10, 13, 19, 31.
 Killdeer, 2, 3, 4, 5, 6, 8, 9, 13, 16, 19, 23, 24, 25, 27, 29, 31.
 Bronzed Grackle, 1 to 6, 8 to 31.
 Cowbird, 1 to 20, 22 to 26, 28 to 30.
 Red-winged Blackbird, 1 to 6, 9, 10, 12 to 19, 22, 23, 25, to 31.
 Kingfisher, 1, 2, 11, 12, 16, 18, 25, 27, 30.
 Mourning Dove, 1 to 6, 9, 11 to 30.
 Phoebe, 2, 3, 14, 15, 18, 19, 22, 27 to 30.
 Towhee, 2, 4, 5, 8, 11, 14, 15, 17.
 Flicker, 2, 3, 4, 5, 6, 8 to 13, 15 to 20, 22, 23, 25, to 31.
 Hermit Thrush, 11 to 16, 18 to 27.
 Wood Thrush, 12, 13.
 Brown Thrasher, 1 to 16, 18 to 20, 22, 23, 25, to 31.
 Catbird, 2 to 31.
 Ruby-crowned Kinglet, 2, 4.
 Barn Swallow, 1, 13, 18, 21, 28.
 Spotted Sandpiper, 1 to 6, 8 to 15, 18, 19, 20, 22, 23, 27, 30.
 Baltimore Oriole, 1 to 31.
 Orchard Oriole, 2 to 11, 13 to 31.
 House Wren, 2 to 8, 10 to 23, 25 to 31.
 Chimney Swift, 1, 3, 4 to 11, 13, 15, 16, 17, 19 to 23, 25, 26, 28, 29, 30, 31.
 Wood Pewee, 11, 13, 14, 16 to 31.
 Crested Flycatcher, 5, 9, 11, 12, 15, 16 to 25, 27 to 31.
 Least Flycatcher, 11, 12, 13, 22.
 Alder Fly catcher, 10, 12, 19, 20, 26, 28.
 Cardinal, 14, 19.
 Gnatcatcher, 2.
 Red-shouldered Hawk, 2.
 Nighthawk, 16, 17, 21 to 24, 27.
 Indigo Bird, 9, 11 to 20, 23, 26, 31.
 Scarlet Tanager, 11, 19.
 Rose-breasted Grosbeak, 10, 11, 13, 14, 16.
 Blue-headed Vireo, 11, 16.
 Warbling Vireo, 1 to 11, 13 to 31.
 Red-eyed Vireo, 17, 19, 20 to 26, 28.
 Greater Yellowlegs, 11, 17.
 Bobolink, 11, 12, 18, 19.
 Dickcissell, 27, 28.
 Bobwhite, 18.
 Purple Martin, 20.
 Yellow-billed Cuckoo, 19, 20, 27 to 31.
 Cedarbird, 2, 19, 22, 25, 26, 27, 29, 30.
 Hummingbird, 29.

Ovenbird, 4, 11, 14.	Tennessee Warbler, 3, 19.
Redstart, 10 to 15, 17, 20, 22.	Chestnut-sided Warbler, 4, 10,
Maryland Yellowthroat, 11, 13,	11, 13, 15, 16, 17.
14, 19, 22, 25, 31.	Connecticut Warbler, 8, 15, 17.
Myrtle Warbler, 1 to 16.	Black and White Warbler, 10,
Yellow Palm Warbler, 1 to 5,	15.
7, 8, 9, 11, 13, 16.	Pine Warbler, 11.
Black-throated Green Warbler,	Magnolia Warbler, 13, 18.
5, 10, 16, 18.	Blackburian Warbler, 16.
Yellow Warbler, 1 to 5, 10,	Black-poll Warbler, 17, 20, 22,
13, 14, 15, 17, 19, 22..	23, 25, 26.
Total number of species seen, 74.	
Total number of species seen in spring, 96.	

OUR BIRDS IN THE WINTER OF 1914-15.

BY BROTHER ALPHONSUS, C. S. C.

The winter of 1914-15 showed an increase in the distribution of the Crow, Blue Jay, Brown Creeper, and Song Sparrow; a decrease, for the White-breasted Nuthatch, Red-headed Woodpecker, Downy Woodpecker, Snowbird, Tree Sparrow, and Chickadee. Very mild weather in February—after the 12th—brought such species as the Bluebird, Robin, Killdeer, and Herring Gull. Species seen last winter, but not this, were: Bronzed Grackle, Meadowlark and Snowflake. The total numbers of species recorded this winter exceeded that of any previous one.

The Crow was recorded the greatest number of times in December—26. In January this species was found on 22 days; in February, on 23 days. The longest interval both in December and January, when the bird was not seen, was 2 days; in February the longest absence was 3 days. For the three months the total number of records was 71—only 3 more than the total of last winter.

The Blue Jay had 29 records both in December and January, and 24 in February, making a total of 82, which was 9 more than the previous winter. The longest interval of absence both in December and January was 1 day; in February, 2 days. The Jay, which had the largest number of records of all the species

seen this winter, also shows the highest total I have ever made for the bird at this season of the year.

The White-breasted Nuthatch was recorded 21 times in December, and 20 times in January, both months having as the longest interval of absence—3 days. In February there were 6 records up to the 8th of the month, when a long interval of 18 days followed, with only one more record—on the 27th. February had 10 records in 1914, and 17 in 1913; showing that this species tends to appear with much irregularity in that month.

The Red-headed Woodpecker was seen on 25 days in December, 14 in January, and 6 in February, making a total of 45 records, which was 21 fewer than the winter of 1913-14. In December the longest absence was 2 days, in January, 6 days; and in February the species disappeared for the long period of 17 days. This is the second winter in which I have found the Red-headed Woodpecker.

The Downy Woodpecker shows 12 records for December, 9 for January, and only 4 for February, with a total of 24 records. This was 17 fewer than the winter before, which had the largest number of records for this species that I have ever made for the season. The longest interval of absence in December was 4 days; in January, 11 days; and in February this species was not present from the 9th to 18th—10 days, and from the 18th to 28th—9 days.

The Brown Creeper appeared on 10 days in December, 18 in January, and 12 in February, making a total of 40 records, which greatly exceeded the two previous winters, 1913-14 having had 13 records, and 1912-13, only 3 records. Here is a case of irregularity that is certainly bewildering. In December the Creeper's longest absence was 9 days; in January, 5 days; in February, only 3 days.

The Snowbird was observed on 7 days in December; on 17, in January; and on 9, in February, the total being 33 records—27 fewer than the previous winter, which had an unprecedented record for this species. There were two long intervals of absence in December—8 and 10 days respectively; in January the longest absence was 4 days; in February, 6 days.

Three Sparrows were found this winter—the Tree Sparrow, the Song Sparrow, and the Vesper Sparrow. In December the Tree Sparrow was recorded 4 times; in January, 14; in February, 11; totalling 29 records. The Song Sparrow had 7 records in December, 2 in January, and 7 in February. The Vesper Sparrow

was observed once—on December 25th—the only winter record I have ever made of this species.

Among rare species seen this winter, the Goldfinch had 5 records in December, 2 in January, and 1 in February; the Screech Owl had one both in December and January, and none in February; the Pine Grosbeak was found once in December; the Chickadee, once in both December and February, and three times in January; the Hairy Woodpecker, once in December; the Cardinal, 3 times in January, and twice in February; the Bluebird was recorded twice in February; in the same month the Robin was seen 8 times, the Herring Gull twice, and the Killdeer once.

DECEMBER.

Crow, 1 to 5, 7 to 13, 15, 18, 19 to 23, 25 to 31.	Downy Woodpecker, 4, 8, 11, 12, 13, 16, 17, 19, 20, 25, 28, 30.
Blue Jay, 1 to 13, 15 to 31.	Screech Owl, 3.
White-breasted Nuthatch, 1, 3, 4, 5, 8, 9, 11, 13 to 16, 18, 21, 23 to 25, 27 to 31.	Brown Creeper, 1, 4, 9, 19, 20, 25 to 28, 31.
Red-headed Woodpecker, 1 to 4, 6 to 9, 11, 12, 13, 17, 18, 20 to 31.	Tree Sparrow, 2, 8, 18, 29.
Goldfinch, 2, 3, 11, 12, 28.	Snowbird, 2, 3, 4, 7, 16, 18, 29.
Song Sparrow, 3, 13, 19, 20, 27, 28, 29.	Pine Grosbeak, 4.
	Chickadee, 25.
	Vesper Sparrow, 25.

Total number of species seen, 14.

JANUARY.

Crow, 1, 2, 4, 7, 8, 10 to 16, 18, 20, 21, 23 to 28, 30.	Downy Woodpecker, 3, 5, 6, 7, 12, 14, 16, 27, 30.
Blue Jay, 1 to 21, 23 to 28, 30, 31.	Screech Owl, 10.
White-breasted Nuthatch, 2, 4, 5, 6, 9, 10, 12, 13 to 16, 18 to 22, 25, 27, 28, 29.	Brown Creeper, 2, 3, 4, 5, 9, 10, 12, 13, 15, 16, 18, 19, 20 to 25.
Red-headed Woodpecker, 4, 5, 11, 12, 14, 15, 17, 18, 19, 24, 26 to 30.	Tree Sparrow, 1, 2, 5, 8, 10 to 17, 20, 25.
Goldfinch, 15, 20.	Snowbird, 1 to 6, 8, 10, 11, 12, 14, 15, 17, 21, 26, 27, 30.
Song Sparrow, 15, 18.	Chickadee, 12, 13, 16.
	Hairy Woodpecker, 15.
	Cardinal, 19, 20, 23.

Total number of species seen, 14.

FEBRUARY.

Crow, 2, 3, 5, 7, 8, 9, 11 to 15, 17 to 28.	Brown Creeper, 1, 3, 4, 6, 8, 11, 13, 15, 17, 20, 22, 27.
Blue Jay, 3, 4, 5, 7 to 11, 13 to 28.	Tree Sparrow, 3, 4, 7, 10, 12, 17, 18, 19, 22, 23, 24.
White-breasted Nuthatch, 2, 3, 4, 7, 8, 27.	Snowbird, 3, 4, 8, 9, 12, 19, 23, 24, 27.
Red-headed Woodpecker, 18, 20, 21, 22, 27, 28.	Chickadee, 8. Cardinal, 3, 7.
Goldfinch, 23.	Bluebird, 13, 17, 20.
Downy Woodpecker, 3, 7, 9, 18.	Robin, 13, 17, 20 to 23, 27, 28 Killdeer, 21.
Song Sparrow, 20 to 23, 26, 27, 28.	Herring Gull, 27, 28.

Total number of species seen, 16.

Total number of species seen during the winter, 20.

CRITICAL NOTES ON NEW AND OLD GENERA OF PLANTS.—IX.

BY J. A. NIEUWLAND.

TRICHOSPERMA

The *Trichosperma* Speg. was anticipated by *Trichospermum* Blume, and should be changed. *Spalovia*^s is herewith offered as a substitute. Joachim J. Spalowski was the author of a work on botany published in 1777 on ranunculaceous genera etc.

Spalovia Nom. Nov.

Trichosperma Speg. not Blume (1825) l. c.

Spalovia pulchella (Speg.).

Trichosperma pulchella Speg.

¹ Blume, K., Bydr. 56 (1825).

² De Cicuta, Flamula Jovis, Aconito, Pulsatilla etc., typ. Trattner (1777) 8, 44 p. 9, pl.

VOLUTELLA

The name *Volutella* Tode seems inapplicable because of an older *Volutella* Forsk¹ (1775). The alternative *Thysanopyxis* Ces. would appear to deserve to replace the other name.

STEINERA

The *Steinera* Zahlbruckner is a homonym to *Steincria* Klotsch² and may be changed to *Molybdoplaca* the specific name of one of the species.

Molybdoplaca Nom. Nov.

Steinera Zahlb. not Klotsch l. c.

Molybdoplaca vulgaris Comb. Nov.

Steinera molybdoplaca (Nyl.) A. Zahlb.

TITANIA

Titania Berlese accepted hitherto as apparently a valid name by mycologists, seems a homonym to the earlier *Titania* Endl³ (1833). *Fremineavia* is suggested as a substitute. Henri Fremineau⁴ was a physician and author of a system of cryptogamic plants.

Fremineavia Nom. Nov.

Titania Berlese not Endlicher (1833) l. c.

Fremineavia Berkeleyi (Berl.).

Titania Berkeleyi Berl.

CLEISTOGAMY IN CUBELIUM.

BY J. A. NIEUWLAND.

The common green violet *Cubelium concolor* Raf. like the other members of the family, shows a tendency to produce cleistogamous flowers after the petaliferous one have either ripened fruit or failed to produce seed. In the latter case this tendency is more marked, but in neither instance apparently do these apetalous flowers appear as abundantly or readily as in the violets proper. Should

¹ Forskahl. P., Fl. Aegypt.—Arab. 84 (1775).

² Klotsch, J. F. Abthand. Akad. Berol 64 t 5, (1854-1855).

³ Endlicher, S., Prod. Fl. Norf. 31 (1833).

⁴ Syst. Vasc. des. Cryptogam. Vasc de France (1868).

an abundance of seed result from the ordinary chasmogamous flowers, the few apetalous ones that appear later at the top of the shoot, ordinarily fall off without setting seed. The plant seems a notable case of contrast in this respect with the other true violets in having few or any fruitful cleistogamous flowers.

The structure and appearance of these closed flowers of *Cubelium* are not unlike those of the stemmed members of *Viola* (Lophion). Petals are completely absent or much reduced. Sepals are somewhat unequal, the inner overlapped ones slightly reduced in size. The two stamens are similar in shape to those of the closed flowers of *Viola*. The pistil has the characteristically recurved style with small open stigma into which from the clasping ovate anthers the pollen is in position to germinate directly. The pollen grains seem to be few and largely abortive.

It would appear that *Cubelium* has not as yet reached the stage of violets or pansies in this character of apetalous flowers, but is more or less transitional in this respect. The fewness and ordinary unproductiveness of the cleistogamous pollen grains and flowers indicate possible an early stage in acquisition of these generally recognized later developed structures.

PROLIFERATION IN CALENDULA.

BY J. A. NIEUWLAND.

An interesting case of teratology was observed in a specimen of garden Marigold. (*Calendula officinalis* L.). In full bloom seven of the outer (ray) flowers by proliferation were grown out into separate smaller but well developed heads, their peduncles being over two and one-half inches long. Buds of other flowers of the main head were still coming out when the specimen was collected in Cincinnati.

All the seven heads were perfect in every way and about one inch in diameter with no further indication of proliferation. The plant had but one well developed head as yet, being gathered rather too early to show other monstrosities if such were present.

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ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—IX.

ENUMERAVIT J. LUNELL.

The Vascular Plants of North Dakota.—IX.

With Notes by J. Lunell.

SYMPETALAE.

Family. 94. **PYROLACEAE** Agardh, Cl. Pl. 18. (1825).

PIROLA Brunnfels, Cuba Hort. Sanit 316 (1485) (not found in Brunnfels under the name *Pyrola*!) Dorsten, Lobel. (Obs. 156, sine descriptione), Clus., Fourn.—Antheras recte descripserunt Torrey, Fl. North Middl. Stat., 432, A. Gray, Chlor. Boreal. Amer. 17. (1846): Bubani.—Linn. Gen. n. 554.

792. *Pirola asarifolia* Michx. Fl. Bor. Am. I: 251. (1803):

Turtle Mountains: St. John.

793. *Pirola tenuior* Clus. Hist. 505. (1583).

Pyrola pannonica Cam. Hort. Germ. 135. (1588).

Pyrola minor Thalius, acc. to E. Bauhin. It could not be found in 'Thalius' Fl. Herc.

Pyrola secunda Linn. Sp. Pl. 396. (1753).

Turtle Mountains: St. John.

Family 95. **MONOTROPACEAE** Lindl. Nat. Syst. ed. 2: 219. (1836).

MONOTROPA Linn. Gen. no. 536, in part.

1221. *Monotropa uniflora* Linn. Sp. Pl. 387. (1753).

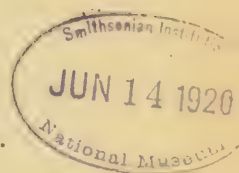
In woods of Sheyenne River, Anselm, Ransom Co., August 1916, (Brenckle & Stevens).

Family 96. **ERICACEAE** DC. Fl. Franc. 3: 675. (1805).

ARBUTUS Virgilius Ecl. III.: 82 Georg. 1: 148, etc. Tourn.

Arctostaphylos Galenus, Tourn. Adans. Lamk. = *Myrtillus*.

Adans. Fam. Pl. II: 165. (1763).



Mairania Necker, *Élém.* Bot. Gen. 363. (1790). Is a monotypic genus: *M. alpina* (L.).

794. *Arbutus Uva ursi* Linn. Sp. Pl. 395. (1753).

Arctostaphylos Uva ursi (Linn.) Spreng. Syst. 2: 287. (1825).

Mairania Uva ursi Desv. Journ. Bot. 3: 38.

McHenry County: Sand Hills.

Family 97. **PRIMULACEAE** Vent. Tabl. 2: 285. (1799).

AMADEA Adans, Fam. II. 230. (1763).

Aretia Haller, Enum. 485. (1742), picked by Bubani, is *A. alpina* which even Linnaeus kept separate from *Androsace*; this name he borrowed from Dioscorides (3: 140), and it is not available because one does not know what it is.

795. *Amadea occidentalis* (Pursh) Lunell.

Androsace occidentalis Pursh, Fl. Am. Sept. 137. (1814).

Pleasant Lake, Towner, Williston.

796. *Amadea diffusa* (Small) Lunell.

Androsace diffusa Small, Bull. Torr. Bot. Club. 25: 318. (1898).

Leeds, Butte, Dunsieith; Dickinson (Cl. Waldron).

797. *Amadea puberulenta* (Rydb.) Lunell.

Androsace puberulenta Rydb. Bull. Torr. Bot. Club 30: 260. (1903).

From New Mexico to Manitoba, acc. to the Manuals.

STEIRONEMA Raf. Ann. Gen. Phys. 7: 192. (1820).

798. *Steironema pumilum* Greene, Leaflets II: 111. (1910).

Leeds, Butte.

799. *Steironema longipedicellatum* Lunell, comb. nov.

Steironema pumilum var. *longipedicellatum* Lunell, in A. Midl. Nat. Vol. II: 157. (1912). Stems ascending from narrow, slender, horizontal rootstocks. Leaves dark green, very thin, broadly ovate, obtuse or subcordate at the base. Filaments tapering from below upwards, of the same length as the anthers. Corolla 20—25 mm. diam., granular. Fruiting pedicels 3-5 cm. long, variously curved, as long as the subtending leaf, or often longer.

Leeds, Butte, Pleasant Lake, Bismarck.

800. *Steironema ciliatum* (Linn.) Raf. Am. Gen. Phys. 7: 192. (1820).

Lysimachia ciliata Linn. Sp. Pl. 147. (1753).

Leaves ovate or ovate-lanceolate, light green, firm. Filaments of equal thickness along their whole length. Anthers twice as long as the filaments. Corolla 25—30 mm. diam. Fruiting pedicels

shorter than the subtending leaf. These are the differential characters found in the plants we consider belonging to the species within the State, and *S. longipedicellatum* is its nearest ally.

Devils Lake, Turle Mountains.

801. *Steironema membranaceum* Greene, Leaflets II: 110. (1910).

Towner, Dunsieith.

802. *Steironema verticillatum* Greene, Leaflets II: 110. (1910).
Butte.

803. *Steironema verticillatum* var. *monstrosum* Lunell,
var. nov.

Rootstock short and thin, with a number of stout, long, fibrous roots. Stem branching freely almost from the base, with lanceolate leaves 4-5 cm. long, rather long-petioled; leaves of the branches broader, 2 cm. long, and of the numerous secondary branches with their almost innumerable verticils ovate, 1 cm. long. The plants though collected immediately before the frost, showed no signs of flower buds. Perhaps their excessive tendency toward leaf production exhausted their ability to complete their growth.

In swampy ground. Leeds.

804. *Steironema Lunellii* Greene, Leaflets II: 110. (1910).
Leeds, Butte.

NAUMBURGIA Moench, Meth. Suppl. 23. (1802).

805. *Naumburgia thyrsoflora* (Linn.) Duby in DC. Prodr.
8: 60. (1844).

Lysimachia thyrsoflora Linn. Sp. Pl. 147. (1753).

Naumburgia guttata Moench, Meth. Suppl. 23. (1802).

Pleasant Lake.

GLAUCOIDES Ruppius, Fl. Jen. 20. (1745), also Fl. Jen.
16. (1726).

Glaux Diosc. 4: 139, and Plin. Nat. Hist. = *Eugalacton*. *Glaux* Clusius = *Astragalus Glaux*, Guilandino *Vulneraria rustica*?, Gesner *Onobrychis sativa*, Anguillara *Lotus*, etc., etc. *Glaux* Tourn. Linn. Gen. II. 291. On the assumption that *Glaux* Diosc. is a name that can never be used because no one can find it applicable, Ruppius' name holds.

806. *Glaucoides maritima* Rupp. l. c. 16. (1726).

Glaux maritima (Rupp.) Linn. Sp. Pl. 207. (1753).

Peninsula of Lake Ibsen, Butte, Barton.

MICROPYXIS Duby in DC. Prodr. VIII: 71. (1844).

Centunculus Dill *Centunculus* Diosc. = *Gnaphalium*. *Centunculus* Plinius = *Polygonum convolvulaceum*. Linn. Gen. n. 145.

Anagallidastrum Micheli, accepted by Bubani, is an odious name.

807. *Micropyxis exigua* (Zorn.) Lunell.

Anagallidastrum exiguum Zorn in Pancov. Herbar. 867. Bubani, Flor. Pyr. I: 238. (1847), ex Michel.

Centunculus minimus Linn. Sp. Pl. 116. (1753).

Leeds; Kulm (Brenckle).

MEADIA Catesby Carol. 3. p. 1. (1731—1743). *Meadia Dodecatheon* Miller, Gard, Diet. VIII. (1768) = *Dodecatheon Meadia* Linn.

Dodecatheon Theophrastus, used for a different plant. *Dodecatheon* Plinius, Nat. Hist. 25: 4 vel 9, was acc. to Ruellius, G. Bauhin, Sprengel, etc. = *Primula veris* (the primrose). "Hanc sententiam amplectere non ausus sum."—Bubani. Still, in the mythology the primrose was thought to be under the special care of the twelve superior gods. (δώδεκα twelve, θεοί gods), and the name is older and better than *Primula*, which was used for the first time by Matthioli (1560). However, under no pretext can it be used as representing the American genus, though it is regrettable to have to dismiss such a beautiful name in favor of *Meadia*. But *Dodecatheon* is the logical name to replace *Primula*.

808. *Meadia thornensis* Lunell, comb nov.

Dodecatheon thornense Lunell in Am. Midl. Nat. Vol. III: 146. (1913) and 343. (1914).

Thorne.

Family 98. **OLEACEAE** Lindl. Nat. Syst. (1830).

LILAC Matthioli Comment Diosc. p. 1236. (1665). This is the first record of the plant. It was said to have come from Constantinople and east of Europe. *Lilac* Tour. Îls. 474. (1694). *Syringa* Dodonaeus Pempt. VI.: 2.16 = *Philadelphus*. The name *Philadelphus* has been used indiscriminately for the lilac, and for the mock orange, and is not a safe name to have. Even Dod. l. c. VI: 2.17—calls the plant *Lillach*! Lilac was called *Syringa coerulea* Doct.

809. **Lilac coerulea** (Doct.)

Syringa vulgaris Linn. Sp. Pl. 9 (1753).

Leeds.

810. **Lilac persica** (Linn.) Lunell.

Syringa persica Linn.

Leeds.

· **CALYCOMELIA** Kostelm. Allgem. Med. Fl. III: p. 1003. (1834).

Leptalix Rafinesque. New Fl. Am. III: p. 93. (1836).

Fraxinus (Virgilius) Linn. Sp. Pl. 1057. (1753), Gen. Pl.

477. (1754), in part.

811. **Calycomelia campestris** (Britt.) Nwd. & Lll.

Fraxinus campestris Britton in Ill. Fl., new ed.

Devils Lake; Fargo (O. A. Stevens).

812. **Calycomelia pennsylvanica** (Marsh.) Nwd. in Am. Midl. Nat. Vol. III: 186. (1914).

Fraxinus pennsylvanica Marsh. Arb. Am. 51. (1785).

Fargo (O. A. Stevens).

813. **Calycomelia lanceolata** (Borck). Lunell, comb. nov.

Fraxinus lanceolata. Borck. Handb. Torst. Bot. I: 126. (1800).

Fraxinus viridis Michx.f. Hist. Arb. Am. 3: 115. pl. 10. (1813)

St. John, Pleasant Lake, Towner, Minot.

Family 99. **GENTIANACEAE** Dumort. Anal. Fam. 20. (1829).

ANTHOPOGON Necker. Élém. Bot. II: 12 (1799) = *Deuckea* Raf. Med. Rep. V: p. 352 (1808).

814. **Anthopogon procerum** Holm, var. **tonsum** Lunell, comb. nov.

Gentiana detonsa var. *tonsa* Lunell in Bull. Leeds Herb. no.

2. p. 7. (1908).

N. B. Flowers numerous, not seldom 15, in this var.

Butte, Towner.

815. **Anthopogon procerum** var. **tonsum** forma **uniflorum** Lunell, forma nova.

In groups where each plant contains only a single flower.

Butte, Towner.

AMARELLA Gesner, Epis. (1577—1591); Gilibert, Fl. Lith. I: 36. (1781).

ANATALYTICAL KEY.

A. Setae of the crown numerous..... *A. theiantha*.

A. Setae of the crown few or none.

B. Leaf-margins not scabrous; corolla 4—5-merous, 6—8mm.

lcrq, lilac colored; herbage darkened in drying..... *A. Gurliæ*

B. Leaf-margins scabrous, corolla 5-merous, 10—16 mm. long,

with blue lobes; herbage remains green in drying..... *A. acuta*.

816. **Amarella Gurliae** Lunell in Am. Midl. Nat. Vol. II: 142. (1911).

Butte.

817. **Amarella acuta** (Michx.) Lunell.

Gentiana acuta Michx. Fl. Bor. Am. I: 177. (1803).

Pleasant Lake.

818. **Amarella theiantha** Lunell in Am. Midl. Nat. Vol. II: 143. (1911).

Flowers 5-merous; the tube quite closed, of a bright sulphur-yellow color, the lobes white; setae of the crown numerous, about 10 to each lobe, or altogether 50, and plainly discernible especially on the fresh plant. *A. strictiflora* (Rydb.) Greene has the flowers 4-merous, ochroleucous, and the tube open; setae of the crown few or wanting.

819. **Amarella theiantha** var. *lactea* Lunell in Am. Midl. Nat. Vol. III: 142. (1913).

Towner.

820. **Amarella theiantha** var. *livida* Lunell in Am. Midl. Nat. Vol. III: 142 (1913).

Butte.

DASYSTEPHANA Rensalmus, Specim. Hist. Pl. p. 68. f. 4. (1611); Adans. Fam. 502. (1763).

821. **Dasystephana affinis** (Griseb.) Rydb.

Gentiana affinis Griseb in Hook. Pl. Bor. Am. 2: 56. (1834).

Leeds, York.

822. **Dasystephana puberula** (Michx.) Small.

Gentiana puberula Michx. Fl. Bor. Am. I: 176. (1803).

Leeds.

823. **Dasystephana Andrewsii** var. *dakotica* (A. Nels.) Nwd. & Lll.

Gentiana Andrewsii var. *dakotica* A. Nels. in Bot. Gaz. XVI: 68. (1913).

Butte, Turtle Mountains.

Family 100. **APOCYNACEAE** Lind. Nat. Syst. ed. 2: 299. (1836).

CYNOPAEMA (Gr. κύων dog, πῆμα, τό, a bane or sorrow to...) Lunell, nom. nov.

Apocynum Diosc. 4: 81 = *Αποκύνον*, Sibth. Fl. Graeca = *Cynanchum erectum*. Tour. Linn. Gen. no. 305.

824. *Cynopaema androsaemifolium* (Linn.) Lunell.
Apocynum androsaemifolium Linn. Sp. Pl. 213. (1753).
 St. John, Bottineau, Devils Lake, Butte, Minot, Des Lacs;
 Ransom Co.: Anselm (Brenckle).
825. *Cynopaema cannabinum* (Linn.) Lunell.
Apocynum cannabinum Linn. Sp. Pl. 213. (1753).
 Butte; Missouri River (a narrow-leaved form, perhaps distinct,
 in the timber).
826. *Cynopaema hypericifolium* (Ait.) Lunell.
Apocynum hypericifolium Art. Hort. Kew I: 304. (1789).
 Leeds, Butte, Devils Lake.
- Family 101. ASCLEPIADACEAE Lindl. Nat. Syst. ed.
 2: 302. (1836).
 AGERATES Ell. Bot. S. C. & Ga I: 316. (1817).
827. *Acerates viridiflora* (Raf.) Eaton, Man. Bot. ed. 5:
 90. (1829).
Asclepias viridiflora Raf. Med. Rep. (II.) 5: 360. (1808).
 Butte, Pleasant Lake, Sand Hills, Towner, Minot.
828. *Acerates Iversii* (Britt.) Woot. & Standl.
Asclepias lanceolata Ives, Am. Journ. Sci. I: 252. (1819),
 not Walt. (1788).
Acerates viridiflora Ivesii Britton, Mem. Torr. Bot. Club 5:
 265. (1894).
 Sand Hills, Pleasant Lake.
829. *Acerates linearis* (A. Gray) Lunell.
Acerates viridiflora linearis A. Gray. Syn Fl. II. Part. I: 99.
 (1878).
 Pleasant Lake.
830. *Acerates lanuginosa* (Nutt.) Dec. in DC. Prodr. 8:
 523. (1844).
Ascerates lanuginosa (Nutt.) Dec. in DC. Prodr. 8: 523. (1844).
Asclepias lanuginosa Nutt. Gen. I: 168. (1818).
 Minot.
- ASCLEPIAS Diosc. 3: 106 Ασκήπιος, Sibth. Fl. Graeca,
 ibid. Tour. Linn. = *Asclepias Vincetoxicum*.
831. *Asclepias incarnata* Linn. Sp. Pl. 215. (1753).
Asclepias incarnata longifolia A. Gray, Syn. Fl. II, part I:
 99. (1878)

Pleasant Lake; Wahpeton (Bergman).

832. *Asclepias speciosa* Torr. Ann. Lyc. N. Y. 2: 218. (1826).
Asclepias Douglasii Hook., Fl. Bor. Am. 2: 53, pl. 152. (1834).
 Leeds, Devils Lake, Minot.

833. *Asclepias ovalifolia* Dec. in DC. Prodr. 8: 567. (1844).
 Leeds, Butte.

834. *Asclepias verticillata* Linn. Sp. Pl. 217. (1753).
 Leeds, Butte.

Family. 102. **CONVOLVULACEAE** Vent. Tabl. 2: 394.
 (1799).

PHARBITIS Choisy, Mem Soc Phys Genev. VI: 438.
 (1833).

835. *Pharbitis purpurea* (Linn.)

Ipomaea purpurea (Linn.) Roth, Bot. Abh. 27. (1787).

Convolvulus purpureus Linn. Sp. Pl. ed. 2: 219. (1762).

Rolette Co.: Ox Creek.

CONVOLVULUS Plinius XXI: 5, Tour. Élé. 72. (1694),
 Linn. Gen. 47. (1737), 76. (1754).

836. *Convolvulus maior* Gesn. Hort. Germ. 255a (1561),
 also Caesalpinus, Lobelius.

Convolvulus Sepium Linn. Sp. Pl. 153. (1753): *κλύμενον*
 Sibth. Fl. Graeca. Diosc. 4: 13.

Banks of Souris River at Minot.

837. *Convolvulus repens* Linn. Sp. Pl. 153. (1753).

Leeds, Towner.

838. *Convolvulus interior* House, Bull. Torr. Bot. Club
 32: 140. (1905). An oracular name!

Leeds.

839. *Convolvulus americanus* (Sims) Greene, Pittonia III:
 328. (1898).

Convolvulus Sepium var. *americanus* Sims, Bot. Mag. t. 732.
 (1804).

Peninsula of Lake Ibsen, Towner.

840. *Convolvulus minor* Diosc. *περικλύμενον* Diosc. 4:
 14. (Sibth, Fl. Graeca), *Ἐλζίνη* (Fl. Gr.), *κισσαμπελος* Diosc.
 4: 39; Gesner, Hort. Germ.; Caesalp., Clusius, Gilib.

Convolvulus arvensis Linn. Sp. Pl. 153. (1753).

Convolvulus ambigens House, Bull. Torr. Bot. Club. 32.
 139. (1905).

Fargo (Cl. Waldron).

Family 103. **CUSCUTACEAE** Dumort. Anal. Fam. 20. (1829).

EPITHYMUM Plinius XXI: 8, also XXVI: 4, etc. *Epithymon* Diosc. IV: 179.

Cassythia Tragus, Hist. 196. (1552), not of ancient Romans.

Cuscuta Dorsten, Tour., Linn. Gen. no. 170, Engelm. Cusc. (1859).

841. *Epithymum arvense* (Beyrich), Nwd. & Lll.

Cuscuta arvensis Beyrich; Hook. Fl. Bor. Am. 2: 77. (1834).

Kulm (Brenckle).

842. *Epithymum plattense* (A. Nels.) Nwd. & Lll.

Cuscuta Plattensis A. Nels. Bull. Torr. Bot. Club 26: 131. (1899).

Peninsula of Lake Ibsen, Pleasant Lake, Dunsieith, Jamestown, Minot.

843. *Epithymum Cephalanthi* (Engelm.) Nwd. & Lll.

Cuscuta Cephalanthi Engelm. Am. Journ. Sci. 43: 336. (1842). Towner.

844. *Epithymum Coryli* (Engelm.) Nwd. & Lll.

Cuscuta Coryli Engelm. Am. Journ. Sci. 43: 337. (1842).

Turtle Mountains, Jamestown; Fort Ransom (O. A. Stevens).

1217. *Epithymum indecorum* (Choisy) Nwd. & Lll.

Cuscuta indecora Choisy, Mem. Soc. Gen. 9: 278. (1841).

Fort Totten.)

1218. *Epithymum Gronovii* (Willd.) Nwd. & Lll.

Cuscuta Gronovii Willd.; R. & S. Syst. 6: 205. (1820).

"Fargo. . . *C. Plattensis* seems closely related to *C. Gronovii* which it replaces west of the Red River valley, according to material at hand."*)

*Vide Notes on the distribution and growth of North Dakota Cuscutae in Am. Journ. Bot. 3: 185—188. (1916), by Prof. O. A. Stevens.

Family 104. **POLEMONIACEAE** DC. Fl. Franc. 3: 645. (1805).

FONNA Adanson, Fam., Pl. 214. (1763).

Phlox was used by Theophrastus as *Phlogionon* or *Phlogion* for a *Lychnis* (acc. to Linnaeus). Anguillara called the *Phlox* Theoph. an *Amaranth* (*Closia*?), others a pansy. Plukenett, Ray changed the name to *Lychnidia* l. *Lychnides*. Linnaeus took up *Phlox*, and he says in Hort. Cliff. 63: "*Phlox* est nomen quoddam Theophrasti desumptum a floris flameo igneoque colore hinc ad *Lychnidum* a plurimis relatum familiam quod cum ibi superfluum

sit hujus generis fecimus, cum ad maximam partem flores flameos et rubros proferat *Lychnidibusque* a facie externa affinis videatur nobis non placet ista nominum apendiculatio quae apud syrones majore non placet ista nominum appendiculation quae apud tyrones majorem confusionem quam ullus error producit."

Lychnidea was applied by Lobelius (1576, earlier than Ray etc.) to a *Silene* or *Lychnis*! Hence it will seem that *Fonna* is the valid name.

845. **Fonna Kelsyi** (Britten) Nwd. & Lll.

Phlox Kelsyi Britten, Bull. Torr. Bot. Club 10: 225. (1892).

In the western part of the state.

846. **Fonna Hoodii** (Richards.) Nwd. & Lll.

Phlox Hoodii Richards. App. Frank Jour. 733. (1823).

Leeds, Butte, Pleasant Lake.

COLLOMIA Nutt. Gen. I: 126. (1818).

847. **Collomia linearis** Nutt. Gen. I: 126. (1818).

Leeds, Butte.

848. **Collomia linearis** var. *congesta* Lunell, var. nov.

While the type has a slender, simple stem even late in the season, this variety is throughout the summer stout and profusely branched almost along the whole length of the stem.

Leeds.

849. **Collomia linearis** var. *picta* Lunell in Bull. Leeds Herb. no. 2, p. 7. (1908). Butte.

NAVARRETIA R. & P. Prodr. Fl. Per. & Chil. 20. (1794).

850. **Navarretia minima** Nutt. Jour. Acad. Nat. Sci. Phila. (II.) I: 160. (1848).

Morton County.

Family 105. **HYDROPHYLLLEAE** Dumortier, Fam. 73. (1829), Richards. Frank. Jour. App. 764. (1823).

HYDROPHYLLON Morin; Jonquet, Hort. 46 ex. Tour. Elém. 71. (1694), also I. R. H. 81. (1700).

851. **Hydrophyllon Morini** Jonquet l. c. (1659).

This is Linnaean *Hydrophyllum virginicum* Sp. Pl. 146. (1753) with a good binary name.

"*Hydrophyllon* est composé des mots Gr. ὕδωρ *eau* and ῥύλλον *feuille*. On doit ce nom à Mr. Morin, fameux fleuriste de Paris, mais on ne sait pas quelle raison il a eu d'appeler cette plante *feuille d'eau*.—Tour. Elém. l. c. 71. 72.

Grand Forks, Fargo.

MACROCALYX Trew, Nov. Act. Nat. Cur. 2:330—332 (1761).

852. *Macrocalyx Nyctelea* (Linn.) Kuntze. Rev. Gen. Pl. 434. (1891).

Ipomaea Nyctelea Linn. Sp. Pl. 160. (1753).

Ellisia Nyctelea Linn. Spl Pl. ed. 2. 1662. (1763).

Leeds, Peninsula of Lake Ibsen.

PHACELIA Jussieu, Gen. Pl. 127. (1789).

853. *Phacelia leucophylla* Torr. Frem. Rep. 93. (1845).

Medora (Bergman).

Family 106. *ASPERIFOLIAE* Haller, Hist. (1742).

Asperifoliae Ray. Meth. XII. p. 94 & 95. (1682): "Asperifoliae appellantur huius generis herbae quia folia plerisque aspera sunt. Florum in his spicae extremas reflexas antequam flores aperiuntur caudae Scorpii in modum contorquentur." Ray. l. c. 95 (Nota in fine diagnoseos 13 generum familiae). *Boraginaceae* Juss. 143. (1789).

HELIOTROPIUM Theoph., Diosc. 4:93, Tourn., Endlicher; Linn. Gen. 37. (1737).

854. *Heliotropium curassavicum* Breyn. Prodr. 2: 55. (1689), ed. 2. 70. (1739); Kiggelaer. Hort. Beaum. Hag. Com. 24. (1690); Herm. Parad. Batav. 340.

Mud Lake (Benson Co.), Barton, Thorne.

855. *CYNOGLOSSUM* Diosc. 4: 129. Tourn. Linn. Gen. n. 100. p. 36. (1737), also Linn. Phil. Bot. (1751) & Zinn (1757); Gerard (1761).

Along the Missouri. (Only very young plants without flowers or fruits).

LAPPULA Guill. Cusa, Hist. Gen. Lgd.; Moench. Meth. 416. (1794).

Echinosperrum Sw.; Lehm. Asperif. 113. (1818).

856. *Lappula echinata* Gilib. Exerc. Phyt. (1792.)

Lappula Lappula Karst. Deutsch. Fl. 979. (1880-83).

Leeds; Kulm (Brenckle).

857. *Lappula texana* (Scheele) Britton, Mem. Torr. Bot. Club. 5: 273. (1894).

Echinosperrum texanum Scheele, Linnaea 25; 260. (1852).

Leeds.

858. *Lappula floribunda* (Lehm) Greene, Pittonia 2: 182. (1891).

- Echinosperrum floribundum* Lehm in Hook. Fl. Bor. Am 2: 84, pl. 164. (1834).
 Peninsula of Lake Ibsen.
 859. *Lappula americana* Rydb. Bull. Torr. Bot. Club 24: 294. (1897).
Echinosperrum deflexum var. *americanum* A. Gray, Proc. Am. Acad. 17: 224. (1882).
 Peninsula of Lake Ibsen, Butte, Devils Lake.
ALLOCARYA Greene, Pittonia I: 12. (1887).
 860. *Allocarya scopulorum* Greene, Pittonia I: 16. (1887).
 Hebron (Bergman).
OREOCARYA Greene, Pittonia 1: 57. (1887).
 861. *Oreocarya glomerata* (Pursh) Greene, Pittonia I: 58. (1887).
Cynoglossum glomeratum Pursh, Fl. Am. Sept. 729. (1814).
Eritrichium glomeratum DC. Prodr. 10:131. (1846).
Krynitzkia glomerata A. Gray, Proc. Am. Acad. 20: 279. (1885), in part.
 Minot.
AMSINCKIA Lehm. Del. Sem. Hamb. 7. (1831).
 862. *Amsinckia lycopsoides* Lehm. l. c. (name only); DC. Prodr. X: 117. (1846).
 Pembina (Bergman).
MERTENSIA Roth, Catal. Bot. I: 34. (1797).
 863. *Mertensia foliosa* A. Nels. Bull. Torr. Bot. Club 26: 243. (1899).
 Willow City, Minot; Dickinson (Cl. Waldron).
 864. *Mertensia coronata* A. Nels. Torr. Bot. Club 29: 403. (1902).
 Williston.
LITHOSPERMUM Diosc. 3: 148, also Plin. 27: 74, Tourn. I. R. H. 55, Linn. Gen. 30. (1737).
 865. *Lithospermum canescens* (Michx.) Lehm, Asperif. 305. (1818).
Batschia canescens Michx., Fl. Am. Bor. I: 130, pl. 14, (1803).
 Leeds, Butte, Dunsieith.
CYPHORIMA Rafinesque, Am. Month. Mag. p. 191. 357. (1819), Cat. 13. (1824).
Lithospermum Linn. or *Batschia* Gmelin, in part.
 866. *Cyphorima linearifolia* (Goldie), comb. nov.

Lithospermum linearifolium Goldie, Edinb. Phil. Journ. 319. (1822).

Lithospermum angustifolium Michx., Fl. Bor. Am. I: 130. (1803). Not Forsk. Fl. Egypt. Arab. 39. (1775).

Batschia longiflora Nuttall, Gen. Pl. I: 114. (1818).

Leeds, Butte, Pleasant Lake, Minot; Kulm (Brenckle).

867. *Cyphorima mandanensis* (Spreng.) comb. nov.

Lithospermum mandanense Spreng. Syst I: 544. (1825).

Orig. description: "L. mandanense 18 L. caule decumbente foliisque linearibus villosis floribus sparsis limbi segmentis fimbriato-crenatis. Ad. fl. Missouri. (*Batschia decumbens* Nuttall)." (ad. orig. cong.)

Morton County.

ONOSMODIUM Michx. Fl. Bor. Am. I: 132. (1803).

868. *Onosmodium occidentale* Mackenzie, Bull Torr. Bot. Club 32: 502. (1905).

Leeds, Butte, Pleasant Lake.

Family 107. **VERBENACEAE** J. St. Hil. Expos. Fam. I: 245. (1805).

VERBENA Cuba, Hort. Sanit. 112 (1485), as substantiated by Nwd. Aug. 2, 1916 in Eurgeon Gen. Lib., Wash. DC. Brunfels, Lon. Ges. Trag. *ἔρρα βοτάνη* Diosc. Plinius has *Verberaca* XXV: 9 used also in this form by several authors: Math. Loc. Cast. Fuchs. Hist. 340. (1549), Cord. Dod. Caes Cam. Clus. Called *Verbenarius* by Plinius XXII: 2. *Verbena* Tour. Linn.

869. *Verbena urticaefolia* Linn. Sp. Pl. 20. (1753).

Jamestown; Harwood (Bergman).

870. *Verbena hastata* Linn. Sp. Pl. 20. (1753).

Peninsula of Lake Ibsen, Butte, Devils Lake.

871. *Verbena bracteosa* Michx. Fl. Bor. Am. 2: 13. (1803).

Leeds, Peninsula of Lake Ibsen, Butte.

Family 108. **LABIATAE** B. Juss. Hort. Trianon (1759).

TEUCRIUM Dioscorides 3: 101, Linn.

872. *Teucrium occidentale* A. Gray, Syn. Fl. 2: 1. 349. (1878).

Leeds, Peninsula of Lake Ibsen, Pleasant Lake.

CASSIDA Columna, Ecphr. p. 187. (1616). Tourn. Dill. Haller, Scop. Ludvig, Moench. Boehmer.

Scutellaria Cortuso, J. Bauhin 3, p. 291. (1651).

873. *Cassida galericulata* Caesalpinus, Herb. Thornab. fol. 126. n. 328. (1563); Scop. Fl. Carn. c. 12, n. 741.

Scutellaria galericulata Linn. Sp. Pl. 599. (1753).

Pleasant Lake, Peninsula of Lake Ibsen, Sheyenne.

874. *Cassida lateriflora* (Linn.) Lunell, comb. nov.

Scutellaria lateriflora Linn. Sp. Pl. 598. (1753).

Towner, Dunsieith.

875. *Cassida parvula* (Michx.) Lunell, comb. nov.

Scutellaria parvula Michx. Fl. Bor. Am. 2: 11. (1803).

Scutellaria ambigua Nutt. Gen. 2: 37. (1818).

Fargo (Cl. Waldron & O. A. Stevens).

AGASTACHE Clayt.: Gron. Fl. Virg. 88. (1762).

Vleckia Raf. Med. Rep. (II.) V: 308. (1808).

Lophanthus Benth. Bot. Reg. 15. (1829). Not Adans. (1763).

Synonym of Linn. in Hort. Cliff. p. 162 (1748), but only in part.

876. *Agastache anethiodora* (Nutt.) Britton, Ill. Fl. 3: 85. (1898).

Hyssopus anethiodorus Nutt. Fras. Cat. (1813).

Hyssopus anisatus Nutt. Gen. II: 27. (1818).

Lophanthus anisatus Benth. Bot. Reg. (1829).

Vleckia anisala Raf. Fl. Tell. 3: 89 (1836).

Vleckia anethiodora Greene, Mem. Torr. Bot. Club 5: 282. (1894).

Turtle Mountains, Dunsieith, Devils Lake.

CATARIA Pena & Lobelius, Adv. 19. (1576); Tourn. I R. H. 202; Boer. Lugd. Bat. 174; Hall Helv. 108; Ludw. Def. Gen. 285; Adans. Fam. Pl. 192, 534; Gilib Exerc. Phyt. 89. (1792), acc. to Bubani.

Nepeta 'Tragus, Hist. (1552), not of ancients; Diosc. ed. Saracen. 454 = *Mentha*. *Nepeta* Plinius, Nat. Hist. 19: 17 vel 47 = *Melissa Nepeta*.

877. *Cataria tomentosa* Gilibert, Exerc. Phyt. 89. p. 12. (1792.)

Nepeta Cataria Linn. Sp. Pl. 570. (1753).

Peninsula of Lake Ibsen. Seemingly native.

CHAMAECISSOS Fuchs. Hist. 506. (1549); *χαμαικισσος* acc. to Daubeny.

Chamaeclema Cord. Hist. 161. (1561). Vaill. Hall. Boerhave. Ludv. Moench, Meth. 393. (1794), acc to Bubani.

Glechoma Linn. Gen. 171. (1737).

878. *Chamaecissos hederaceus* (Linn.) Nwd. & Lll.

Chamaeclema hederacea Moench, Meth. 393. (1794).

Glechoma hederacea Linn. Sp. Pl. 578. (1753).

Wahpeton (Bergman).

DRACOCEPHALUM Morison, Hist. Pl. Oxon. 3: 364.

(1669); Linn

879. *Dracocephalum parviflorum* Nutt. Gen. 2: 35. (1818).

Moldarica parviflora (Nutt). Britt. Ill. Fl. ed. 2, 3: 114. (1913).

Turtle Mountains.

880. *Dracocephalum parviflorum* var. *chelenicum* Lunell, var. nov.

Folia lanceolata, in dimidia parte superiore caulis aristato-dentata, inferiora basi cordata ovata. Flores venuste rubicundi.

Leaves lanceolate, on the upper half of the stem having aristate teeth; the lower leaves ovate with cordate base. Flowers a beautiful pink.

Turtle Mountains.

881. *Dracocephalum thymiflorum* Linn. Sp. Pl. 596. (1753).

In a bromegrass field, Belfield (O. A. Stevens).

PRUNELLA Fuchs, Hist. Stirp, 212a (1546), ed. without illustration, also 621. (1549); Tragus, Stirp, Hist. 310. (1552).

882. *Prunella vulgaris* Tragus l. c. (1552); Linn. Sp. Pl. 600. (1753).

Butte, Pleasant Lake.

PHYSOSTEGIA Benth. Lab. Gen. & Sp. 504. (1834).

883. *Physostegia formosior* Lunell in Bull. Leeds Herb. No. 2, p. 7. (1908).

Minot, Towner. Its range has been extended even as far as to Illinois vide [Earl E. Sherff, Vegetation of Skokie Marsh, in Bull. Ill. State Lab. Nat. Hist. Vol. IX: 606 (1913)]

LIST OF THE NAIADES OF THE MERAMEC RIVER, MISSOURI.

BY N. M. GRIER.

The recent work of Utterback¹ on the "Naiades of Missouri" anticipated to a certain extent efforts along similar lines by the writer. Collections had been made at various points along the Meramec River, and the specimens secured identified with the

¹ American Midland Naturalist. Vol. IV. 3—10 Inclusive.

aid of Dr. A. E. Ortmann. Since the Meramec is in great danger of depopulation of its Naiades through ravages of pearl hunters, etc., it is thought worth while to publish the following list:—

Family Unioniade (Swainson)

1. *Fusconaia undata trigona* (Lea)
2. *Amblema (plicata) costata* (Raf.)
3. *Megalonais heros* (Say)
4. *Quadrula pustulosa schoolcraftensis* (Lea)
5. *Quadrula verrucosa* (Raf.)
6. *Quadrula metanevra* (Raf.)
7. *Rotundaria tuberculata* (Raf.)
8. *Pleurobema aesopus* (Green).
9. *Pleurobema obliquum plenum* (Lea).
10. *Pleurobema obliquum pyramidatum* (Lea)
11. *Elliptio nigra* (Raf.)
12. *Elliptio dilatata* (Raf.)
13. *Strophitus edentulus* (Say)
14. *Obliquaria reflexa* (Raf.)
15. *Nephronais ligamentina* (Lane)
16. *Amygdalonnais donaciformis* (Lea)
17. *Amygdalonnais truncata* (Raf.)
18. *Plagiola securis* (Lea)
19. *Lampsilis anodontoides* (Lea)

Central High School, St. Louis, Mo.

PARASITISM AMONG MISSOURI NAIADES.¹

BY W. I. UTTERBACK.

This paper would consider only the subject of parasitism in the sense of the *Naiades*, or Fresh-water Mussels, as hosts and not as parasites. As well known among students of *Naiades* nearly all the Species are parasitic in the glochidial, or larval, life on fish hosts, the two notable exceptions, so far known, being in case of *Strophitus edentulus*² and *Lastena ohionensis*, (= *Anondota*

¹ Contribution, (in part), from U. S. Biological Station, Fairport, Iowa. Published by permission of the Commissioner of Fisheries.

² George Lefevre and W. C. Curtis, U. S. Bu. Fish. Doc. No. 756, XXX, pp. 171-174. 1912.

*inbecillis*³). However, reference should be made to the author's descriptive and illustrated catalogue of *Missouri Naiades*⁴ for detailed accounts of Mussels as parasites as well as that of the juvenile and adult life. In this present report the writer would employ the same revised nomenclature as used in his general catalogue. This revision is made necessary because of the recent revival of *Rafinesque's Priority*⁵ and also because of the well determined fact that the nutritive and reproductive structures of the soft parts serve as far more satisfactory bases for classification than shell characters. However, for the sake of clearness, synonyms for the revised names appear in the parentheses, as indicated in the case of *Lastena ohioensis* mentioned above.

Since it has been observed that the nucleus of the pearl, found in the Fresh-water Mussel, is that of the remains of some mite or worm it is concluded that these parasites so irritate the glandular mantle that an abnormal pearly excretion is laid over the irritant in regular, but usually, irregular, layers while these pearl glands endeavor to functionate normally in building the inner, or pearly, lining of the shell. Hence, the writer, while engaged in securing data for cataloguing the *Naiades of Missouri*, devoted much incidental attention to the study of Mussel parasites since the Pearl Mussel Investigation occupied the author's attention for most of the four years, (1911-1915), when the greater part of the State came under his actual personal survey. As it was his pleasure and profit to make studies of the *Naiades* at the U. S. Fisheries Biological Station, Fairport, Iowa, where both natural and artificial production of the fresh-water pearl is experimentally studied, some data have been secured under the auspices of this Station. For the identification of the following tabulated list the writer is indebted to Prof. H. Walton Clark, one of the personnel of the Fairport Station and a recognized authority on the natural production of the pearl.

In order that the delicate soft parts of these parasites, such as antennæ, thoracic appendages, etc., may be preserved and kept pliable for future study Kœnigke's Fluid is used, the receipt of which is submitted here:—

³ A. D. Howard, Science, N. S., XL, pp. 353-355, Sept. 4, 1914.

⁴ American Midland Naturalist, IV, No's. 3-10, 1915-1916.

⁵ L. S. Frierson, Nautilus, XXVIII, pp. 6-8; also E. G. Vanatta, Acad. Nat. Sci. Phil., pp. 549-559, Dec. 8, 1915.

PARASITES OF MISSOURI NAIADES.

MUSSEL PARASITE.	KIND.	MUSSEL HOST.	PARTS AFFECTED.	LOCALITY.
1. <i>Alax (Naiadicola) ingens</i> Koenike	Mite	<i>Nephronia ligamentina</i> (Lam.) (= <i>Lamp. ligamentina</i>).	Gills	White R., Hollister.
2. <i>Alax tumidus</i> Wolcott.	Mite	<i>Lasimona costata</i> (Raf.) (= <i>Symphynota costata</i> (Raf.))	Gills and Palps.	White R., Hollister.
3. <i>Alax stricta</i> Wolcott.	Mite	<i>Proptera alata</i> (Say) (= <i>Lamp- silis alata</i>)	Branchial Papil- lae	Platte R., Agency Ford.
4. <i>Alax ypsilophorus</i> (Bonz)	Mite	<i>Lastena suborbiculata</i> (Say) (= <i>Anodonta suborbiculata</i> (Say)).	Gills and Papillae	L. Contrary, St. Joseph.
5. <i>Aspidogaster conchicola</i> Von Baer	Fluke (Final Form)	<i>Lasmonos fragilis</i> (Ruf.) (= <i>Lamp. gracilis</i> (Bar.) (Final Host)	Pericardium and Nephridium	Osage R., Warsaw.
6. <i>Calylopsis insignis</i> Leidy	Fluke (Final Form)	<i>Anodonta grandis</i> Say. (Final Host)	Gills	Mud Lake, Kenmoor.
7. <i>Marginal-Cyst</i> Distomid Kelly	Trematode	<i>Lampsilis cardia</i> (Raf.) (= <i>Lampsilis ventricosa</i> (Parnes))	Mantle Margin	Black R., Williamsville.
8. <i>Fissionid</i> of Osborn	Trematode	<i>Strophilus edentulus</i> (Say)	Mantle Margin	Osage R., Osceola.

Glycerine.....	2	parts by volume
Distilled Water.....	3	" " "
Glacial Acetic Acid.....	2	" " "
Absolute Alcohol.....	1	" " "

The author has noted a common teratologic, if not pathologic, condition in the shell, usually that of *Quadrula quadrula* Raf. (= *Q. lachrymosa* (Lea)) and also of *Anondonta grandis* Say, that is, an extremely emarginated postventral portion, due no doubt to the attacks of ecto-parasites along the mantle margins at this point. Why the attacks should be mostly made at this point is a question. Other results of this parasitism is a splitting of the gills from this post-ventral point to the dorsal side. From the fact that this dividing of the gills and the "tucking in" of the shell take place equally on both sides we would ascribe the cause to that of sympathetic nervous reaction. Probably many of the so-called new species or varieties that have crept into our catalogues on *Naiades* are only these pathologic or teratologic individuals and as a result "confusion has been made more confused."

Although the lacustrine forms of *Naiades* are more greatly parasitized than those of the fluvatile due to more favorable ecologic conditions for the parasites, yet the formation of free pearls are more rare in the former since these are usually the thin-shelled forms that do not need to secrete such a limy or nacreous supply from the mantle glands. The thick-shelled forms of the lake or sluggish stream, however, are, as a rule, good pearl producers since the greater abundance of parasites under such conditions insure greater occasion for pearl formation.

THE BIRD LOVER.

BY BROTHER ALPHONSUS, C. S. C.

The lover of birds is an enthusiast. If he were not, he would not be a lover of birds. Only those whose interest in any subject is intense and unabating can in truth be said to have enthusiasm in its pursuit. What, it may be asked, will lead a person to spend his precious time upon some matter apparently unworthy of such a sacrifice? There is in the thing something that awakens a

responsive sentiment. An elevated feeling, as we know instinctively, is not the result of calculation or forethought, but comes upon us spontaneously—just how we do not understand. By cultivation, the awakened sentiment grows in intensity, and the emotional element contributes not a little to the persistent devotion that is a characteristic of enthusiasm.

Now let us apply these ideas to the subject of bird life. There is in all living things much of paramount interest, and worthy of man's serious study. Life, in all its grades, is a great mystery, and to investigate its myriad phases, naturally challenges the astuteness of the human intellect. And when those beautiful creatures which we call birds are the particular form of life chosen for patient observation, we have an interest that quickly grows to be intensely satisfying. So much is manifest in the life of a bird that both our senses and our intellect find matter for almost indefinite investigation.

No doubt most persons at first do not acquire a scientific interest in birds, but are led gradually from the emotional to the philosophic aspect of the subject. I suppose also that individual temperament will decide what amount of attention each one will eventually give to the aesthetic and scientific phases of ornithology. In this matter, I think much will depend upon one's leisure for the pursuit. If one cannot observe regularly, there is less likelihood that anything more than an aesthetic interest in birds will be developed. But even this is well worth the time that is spent in studying the habits of the many species of birds which are found in our parks or in the country.

What pure pleasure is there in strolling leisurely into the country, with only nature for our companion. As soon as we reach the limits of the city, we are greeted by the clear notes of the Song Sparrow. And as we advance a little farther, the Field and Vesper Sparrows will repeat for us their charming strains. Another songster that is sure to challenge our attention is the Warbling Vireo, almost as persistent a singer as the Song Sparrow. And if our walk is taken in the month of May then the bird chorus will bewilder us. Catbirds, Thrashers, Wrens, Warblers, Finches, Grosbeaks, Orioles, and many other species are then in full song.

As compared with those who have an aesthetic interest in birds, there are few with opportunity for a scientific study of ornithology. It has, however, been a matter of wonder to the

writer that many who were brought up on farms, or who have lived in the country for much of their lives, have yet so little interest of any kind in bird life. Naturally we should expect our scientific ornithologists to come from this class. Why are so few of such persons interested in birds? I think there are various reasons for their apathy to so delightful a pursuit. Although they live in the country, their sympathy with nature remains undeveloped. They lead lives that are as artificial as those of the city. The newspaper, their own avocation or profession, consume all their time; or if they have any leisure, it may be spent in novel reading or frequenting the shows of the neighboring town. Thus most persons become slaves to the conventions of civilization.

Can anything be done to lessen this dullness and insensibility to the superior pleasures that nature affords her devotees? Yes, there seems now to be an excellent opportunity to well-nigh revolutionize the sad condition that has existed for generations. This is to get our young people interested in bird life, and happily to do so is a pleasant task for teacher or friend. The young are born naturalists, waiting only for the necessary encouragement in order to develop their endowments.

Beyond doubt the youthful student of ornithology is likely to become a true bird lover. Such habits of mind as attention, observation, judgment, appreciation of the beautiful being in the process of formation, the impulse to persevering efforts to gain all the facts of this branch of natural history is strong and stimulating. Probably no other pursuit is as fruitful in opportunities to cultivate these indispensable requisites of an educated man. At the same time, it is also probably true, that hardly any other study is less irksome than the observations of the ornithologist. So while accumulating valuable scientific knowledge, the student of bird life is strengthening his mental power continually. How much better is it for the boy or youth who acquires a taste for ornithology to spend his free hours in such a way as to develop his body and mind than to fritter away the precious years of his early life in unfruitful diversions.

Incidentally many other advantages will be the result of the persistent labors of the bird lover. Fresh air, a good appetite, no loss of sleep, and above all an unfailing cheerfulness are but a few of these advantages. Nothing need be said to prove how great a gain it is to possess these benefits. I cannot refrain, however,

from enlarging a little on the last and best of the blessings just enumerated. The excellent health that is always enjoyed by a naturalist gives him the fine virtue of cheerfulness. If you meet him on one of his rambles, you will be sure to receive a friendly greeting. And should you desire a little diversion yourself, take a walk with him, and you will soon forget all annoyances and become infected with his buoyancy of mind and heart. Fortunate is the community that has a number of naturalists to keep it fresh and sanguine.

But the bird lover confers yet more benefits upon his neighbors and friends. His knowledge of bird life will make him welcome to bird societies, either local or in places distant from his home. So soon as any person is known to be interested in birds, his acquaintance will be eagerly sought by other bird lovers. And there is in all lovers of birds a sympathy for one another that is admirable. Although strangers in other respects, as soon as ornithologists meet they are at home in each other's company. They seem also to possess certain traits of temperament that make their society congenial to themselves. Next to religion, nothing can develop sympathy for all of God's creatures more readily than the love of nature.

Let me now, before ending this short paper, emphasize the educational value of the study of birds. It has been admitted by noted educators that the system of instruction in our schools, colleges, and universities does not give the fullest development possible to their students. Too much stress is laid upon class exercises and tests, and too little upon the close companionship with nature. The opportunities for the delightful study of the varied phenomena of nature are greatly undervalued. All the requisites of an open and sympathetic mind are found in the study of the creatures that live in our midst. Briefly the bird lover is introduced into a world that is well-nigh limitless in the interest it can arouse in its devotees. Beauty, song, instinct, habits, migration, distribution are but a few of the aspects of ornithology. Every bird that flies within view at once enlists the attention of the observer, who knows that he may learn something new and noteworthy. Try to estimate, if you can, the total effect of a life devoted to the study of birds. If there is an earthly paradise, it will be found in the fresh fields and secluded woods where the birds raise their sweet voices in praise of their Maker.

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